CHEMICAL PUMPS
INDEX FOR 1959

Manufacturing Chemist

incorporating

MANUFACTURING PERFUMER

Vol. XXX No. 12 A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP DECEMBER 1959

Season's Greetings

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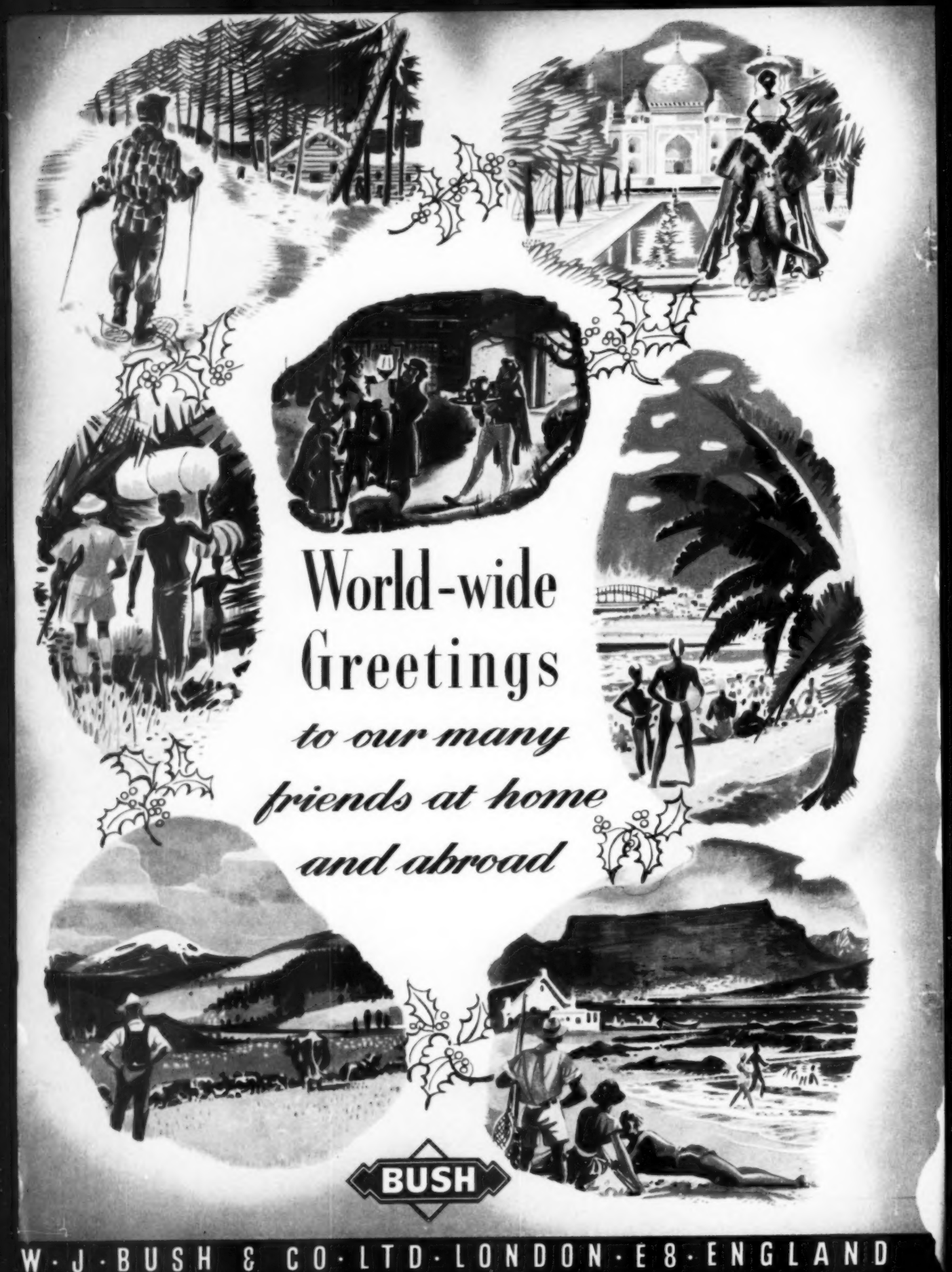
and thank you for choosing our Chemicals during 1959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Greetings
to our many
friends at home
and abroad
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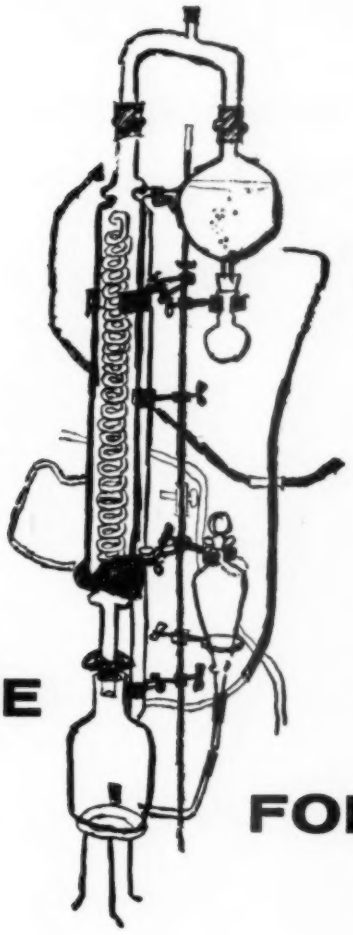

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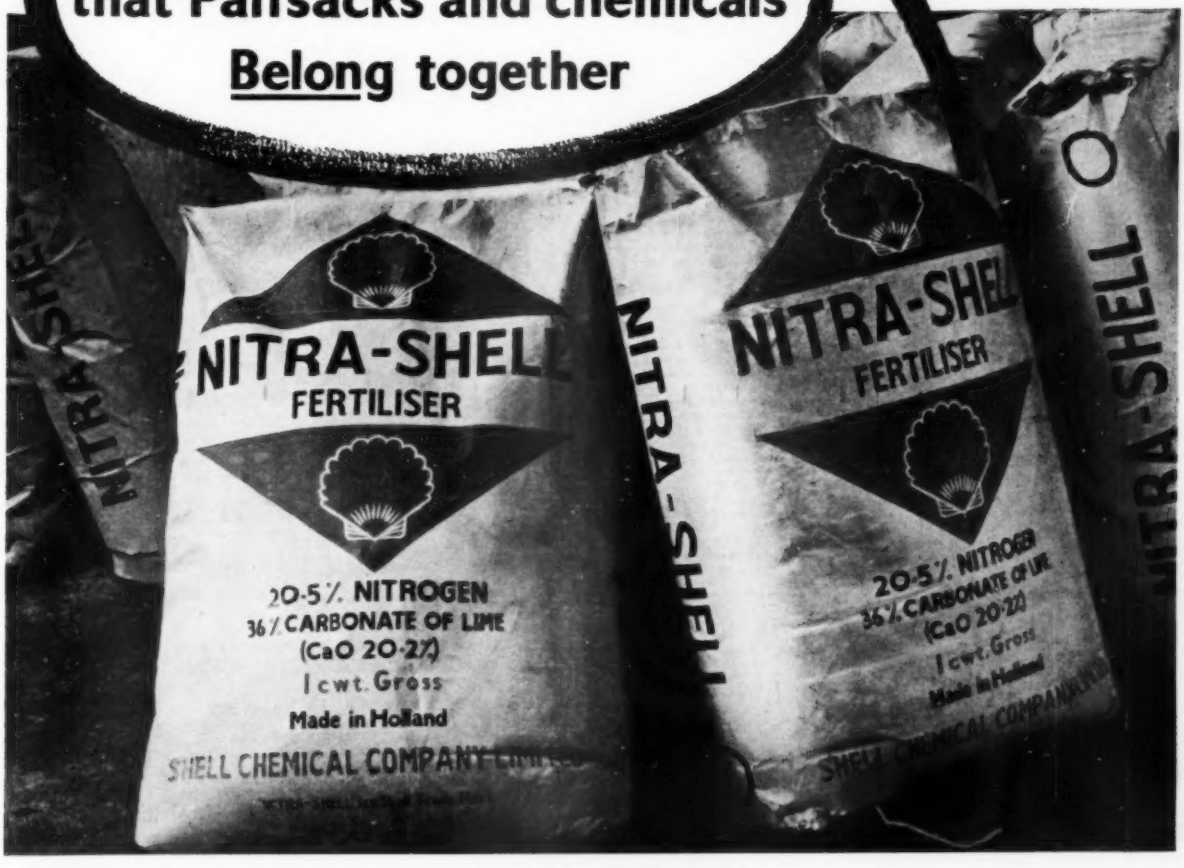

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"Tested in Store. *From April, 1956 to May, 1957, consignments of NITRA-SHELL were kept in several stores in different parts of the country, under varying conditions — all of them typical of commercial storage. In one store the bags were stacked directly on concrete, in another they were stacked thirty high and so on.*

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and textiles . . . and . . .

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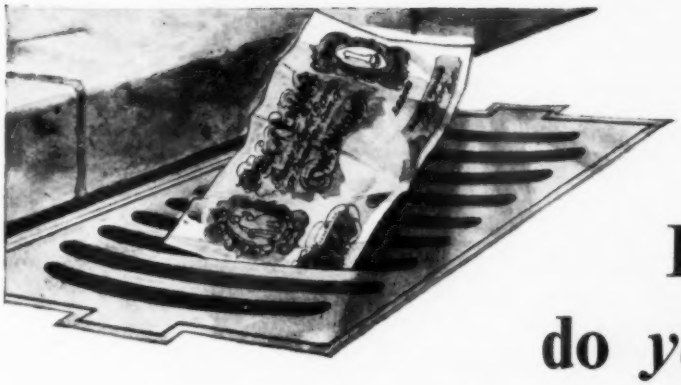

How quickly do *you* lose £1?

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Do you write off £1-£10-£30 a day, *every* day, with equanimity? You probably do if you run hot effluents to drain, or exhaust hot vapours to atmosphere.

Just consider. 250 gallons an hour of 190°F effluent run to waste from, say, a bottle washer, loses heat to the value of 20 shillings' worth of fuel every shift. At 10,000 gallons an hour (spent wash ?) the loss is equivalent to £1 *every thirteen minutes.*

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*Brochures A*334 and *A*340 *give details.*

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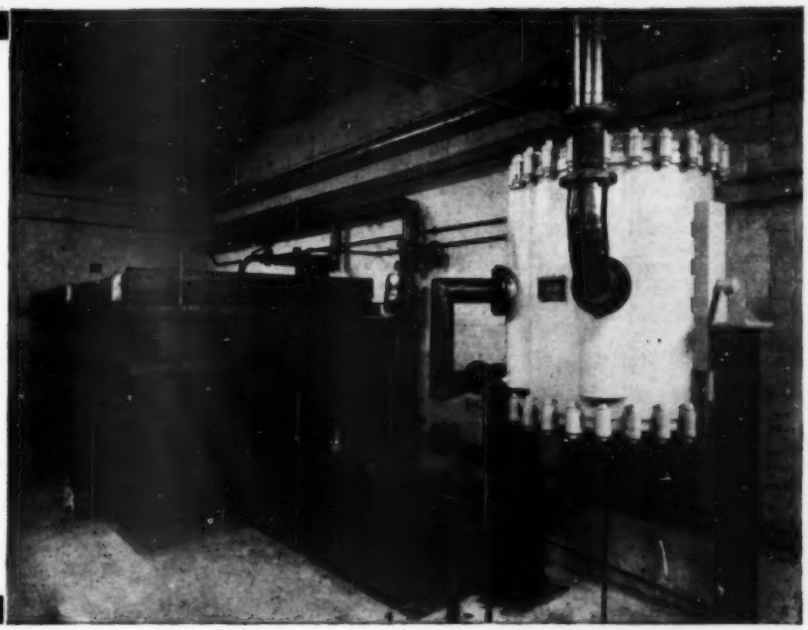

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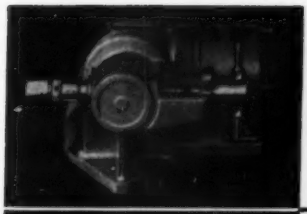
Send for further details and price.

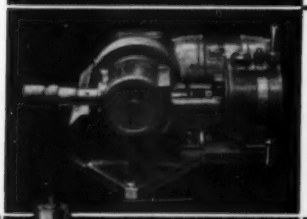
JACW/P/2

DCL metering pumps



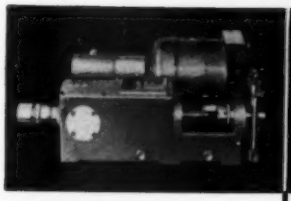
Micro Pumps with plunger heads

For metering small constant flows in laboratories and plants. Variable capacities from 0-7 to 0-1500 ccs/hr.



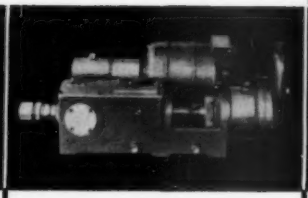
Micro Pumps with diaphragm heads

No glands in contact with the pumped liquid. Range of capacities from 0-7 to 0-1500 ccs/hr.



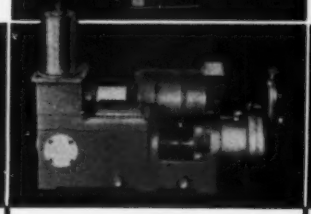
'M' Pumps with plunger heads

For accurately metering most liquids. Variable capacities by stroke adjustment from 0-750 ccs. to 0-37.3 litres/hr.



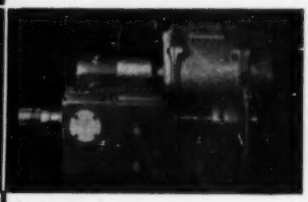
'M' Pumps with diaphragm heads

No glands in contact with the pumped liquid. Covers ranges from 0-750 ccs. to 0-37.3 litres/hr.



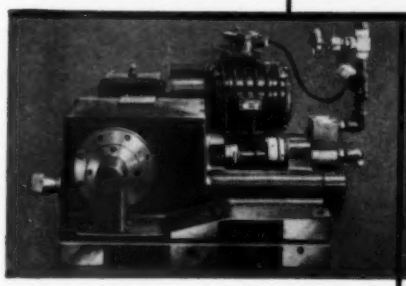
'M' Pump for automatic control

Responds to instrument air pressure of 3-15 p.s.i.g. the capacity being lineally proportional to air pressure.



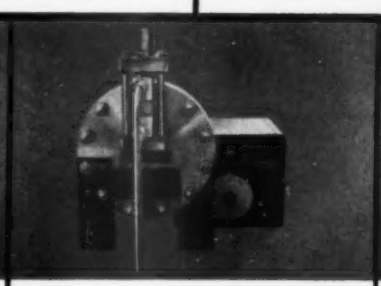
'M' Pump with flameproof motor

All 'M' pumps can be supplied fitted with flameproof motors, Buxton certified for Group II gases.

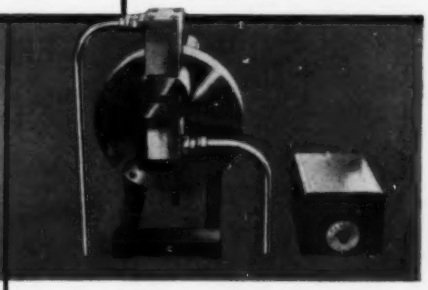


'U' Pump, single or duplex acting

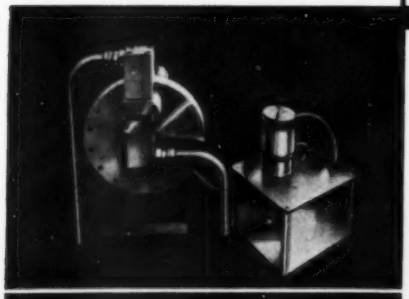
For higher pressures and capacities.

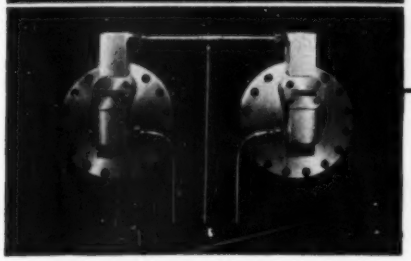


Air-operated electrically timed diaphragm pumps. Wide range of capacities for accurate metering of liquids. Especially useful for noxious materials and for pumping under sterile conditions.



Hydraulically operated electrically timed diaphragm pumps. Extends the range of the air-operated electrically timed diaphragm pumps for applications where suction heads are not available or where higher delivery pressures are required.





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Single acting pneumatic hydraulic flameproof pumps.

Double acting pneumatic hydraulic flameproof pumps.

Suitable for flameproof areas; no electrical equipment necessary, requires only to be connected to a compressed air source.

transfer pumps

High-pressure pumps for liquefied gases.

Full information is available on request

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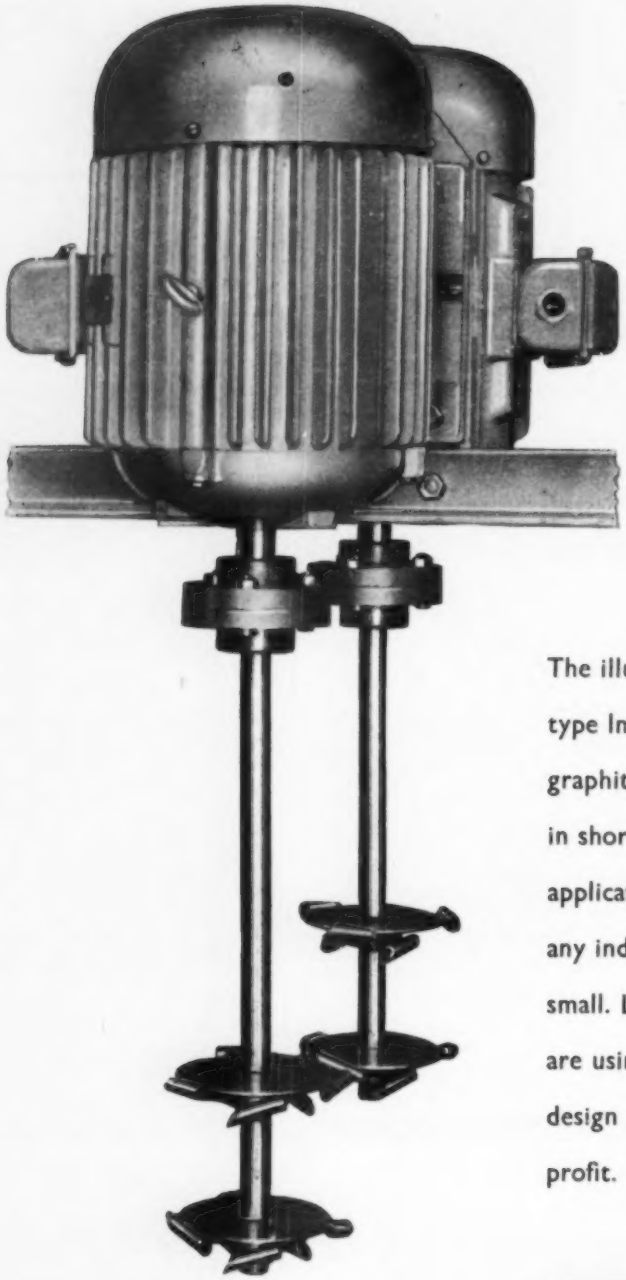

Controlled Mixing with PLENTY IMPELATORS

The illustration shows a pair of Plenty industrial type Impelators as supplied for the mixing of graphite pastes. They give a more efficient mix in shorter time on one of the most difficult applications. The Impelator can be adapted to meet any industrial mixing problem, whether large or small. Leading firms in this country and the U.S.A. are using Plenty Impelators and the services of Plenty design engineers with conspicuous success and profit. Fullest details gladly sent on request.

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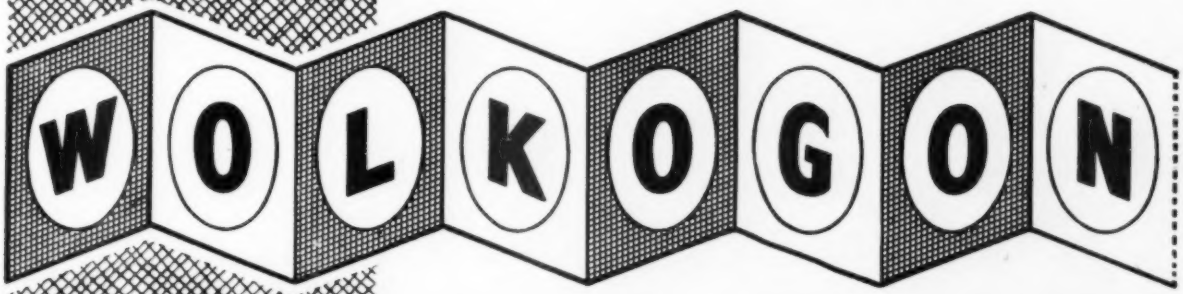

EQUIPMENT

a versatile range for the manufacturing chemist

for strip packaging of tablets, capsules, suppositories, powders and liquids

Further information and illustrated brochure from:
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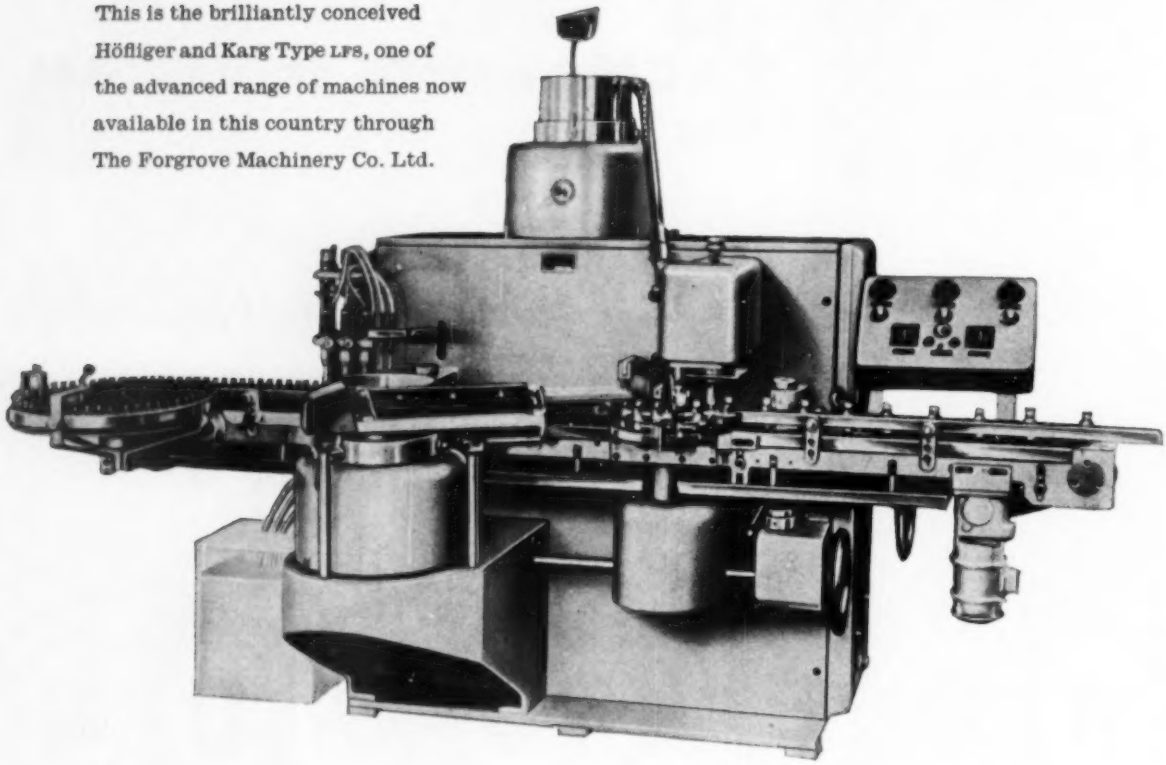
75-79 Farringdon Street, London, E.C.4. Telephone: FLEet 5211

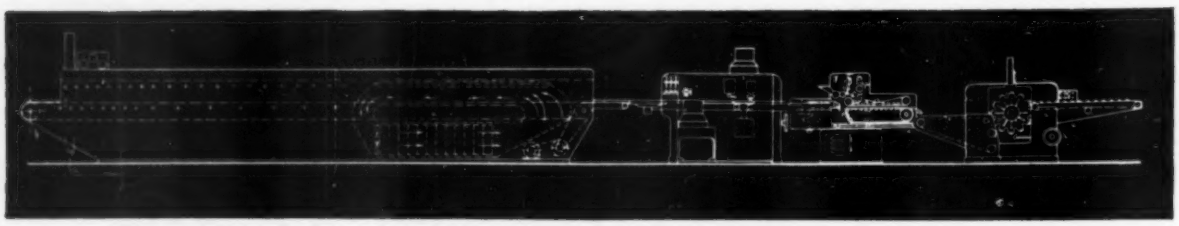
Fully automatic answer

to a Vial problem

This is the brilliantly conceived Höfliger and Karg Type LFS, one of the advanced range of machines now available in this country through The Forgrove Machinery Co. Ltd.



The H & K LFS is fully automatic, fills and closes vials at a rate of 60-120 per minute, can be used independently or as a unit in a machine line-assembly which will automatically dry and sterilise the vials and fill, seal, and carton in one continuous operation.



For further details of the Höfliger and Karg Type LFS vial filling and closing machine, please write to:

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Your enquiries are welcomed and literature describing the 'Coalite' range of products is available on request.

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LONG LIFE—Nylon filter cloths have much greater life expectancy because of nylon's excellent tensile and rupture strength, wet and dry; its superb abrasion resistance; its resistance to chemical attack and extremes of temperature, and its immunity to attack by mildew and fungi.

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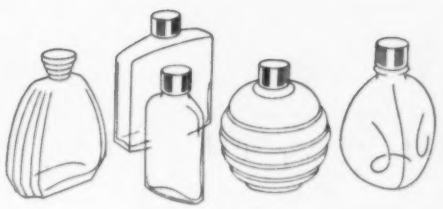

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Kork-N-Seal make a larger variety of closures than any other British manufacturer, for glass, metal and plastic containers. As part of United Glass Ltd., Britain's leading makers of glass containers, they can produce and deliver your closures and glass containers together.

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CALADRYL
CALAMINE AND BENADRYL* LOTION
Soothes and relieves minor skin irritations, insect bites and sunburn.
Contains: Calamine (U.S.P.), 8%. Benadryl (Diphenhydramine Hydrochloride. P. D. & Co.), 1%. Camphor, 0.1%
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*Trade Mark
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'Viskring' and 'Viskap' cellulose bottle closures set the seal on your product—both you and the customer can be confident that the contents reach him in perfect condition. 'Viskrings' and 'Viskaps' protect the contents, prevent adulteration, reduce evaporation and pilferage. What's more, these seals not only are hygienic, they *look* hygienic and, when removed, leave the bottle neck perfectly clean.

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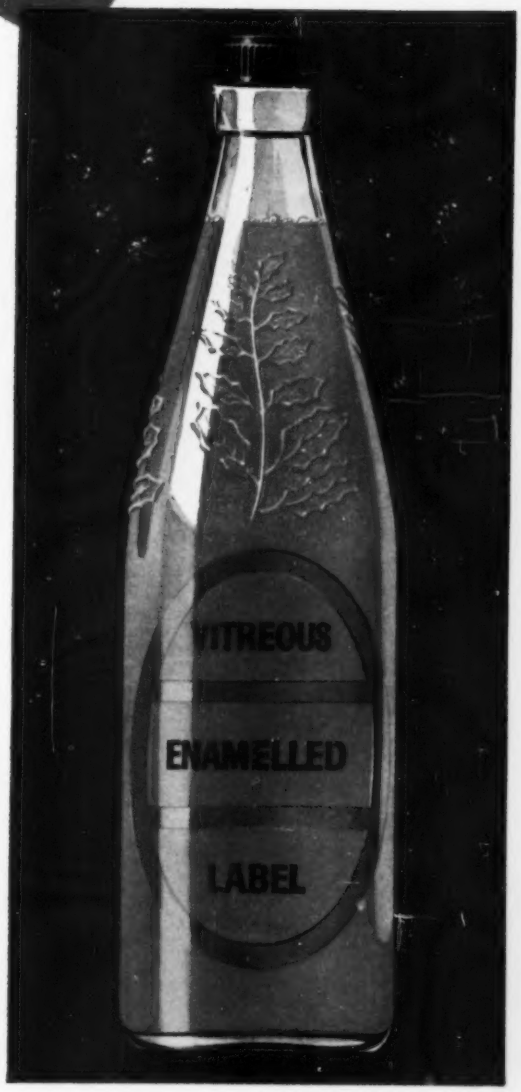
What d'you mean...

the label should be in the bottle?

I WAS a label hater. From the moment they put me in charge of our bottling plant everything came unstuck—me, the labels, the lot. Machinery all gummed up, labels on crooked, labels on crinkled, labels not on at all. Nobody would even speak to me. Then I had a chat with the man from United Glass. He said the best kind of labels aren't *on* the bottles, they're *in* them. Fired right into the glass. Vitreous enamelled labels. Now I get my bottles from him I'm the hero of the factory—and I don't have to do a thing.

Vitreous enamelled labels, in one, two or three colours, screen printed and fired into the glass, take the whole job of labelling off your shoulders. No need to get labels printed. No need for labelling machinery. No relabelling. No clogged washing machines. United Glass will submit designs or work to your designs. And if ever you have a glass packaging problem, the United Glass Packaging Advisory Bureau will always be glad to help. Please get in touch at the address below.



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ADD *Sellomation*...

COLOUR

For coding—to indicate contents and freshness of packs, filing and identification systems. For decoration and display work in shop and store, toy manufacture, marking of floor areas in factories, studios etc.

MACHINES AND METHODS

There is a correct application method for every purpose. Automatic, semi-automatic and hand operated dispensing equipment is available for the workbench, counter and packing room.

STICK-AT-A-TOUCH LABELS

Fastest and most durable medium for applying brand name, technical information or instructions to product or pack, where direct printing is not practical or economical. Normally difficult-to-label surfaces are no problem to the Sellotape label.

REINFORCEMENT

An entirely new approach to the problem of reinforcing cartons for despatch, completely eliminating the danger of the strapping medium damaging contents.

PUBLICITY

"AD-SEALS" seal the parcel, package or container *and* advertise the product. "AD-STRIP" puts the brand name on shelf-edge, display case or counter where it cannot be overlooked.

★ *Sellomation* = *Sellotape* + KNOW-HOW

Sellotape is the Registered Trade Mark of Adhesive Tapes Ltd.

Sole Distributors in the U.K.

GORDON & GOTCH (SELLOTAPE) LTD.

MULTIPLY EFFICIENCY!

With *Sellomation* this "3-in-one" is easier done than said!

THE SEALING MEDIUM

"Sheenshield" Printed Sellotape ensures 100% durability for the message. Thus it withstands all abrasion hazards in handling and storage because *it is printed under the film's surface.*

. . . and a NEW development in pigmented adhesive

An adhesive with a higher tack than was hitherto possible is now standard in the Sellotape Coloured Range. This means that for bundling operations like this one by Pet Foods Ltd., the sealing bands are now even better equipped to do their job of forming the three units into one piece.

THE APPLYING METHOD

A battery of "Autotaper" machines working automatically apply the two Printed "Sellotape" bands precisely, economically and speedily. Rolls of 576 yards are used on the machine. Spliced joins make this roll size possible to give maximum continuity of operation, eliminating constant reloading.

PRINTED **Sellotape**

High tack—fast unwind.

INSULATION

"Polythene Electrical" and P.V.C. self-adhesive tapes are perfect insulating mediums for use in electrical work. Waterproof, and made in a range of colours for coding. Also used in "curtain wall" insulation.

BAG CLOSURES

Bag-Neck Sealer applies self-adhesive seal simply and quickly around twisted neck of bag, giving a "flag" for price or weight marking. "Sello-Folds" are non-adhesive ties requiring no knotting.

PROTECTION AND MASKING

Special tapes to prevent entry of moisture, acids, alkalis, oils or solvents; to resist corrosion and abrasion of surfaces. Masking tape range meets every industrial requirement.

An answer to many PACKAGING PROBLEMS

Sealing of rigid or collapsible boxes or cartons; securing lid, stopper, cork, filler cap . . . combination label/seals . . . premium pack bundling.

TYING MEDIUM

"Sello-Ribbon"—decorative, rayon strengthened, gaily coloured, adds glamour to bundled, banded and boxed goods. Printed with brand name or message, it is a valuable publicity medium.

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Sellotape "simplifies the job" and saves money. Appreciable saving of labour time is an important factor in all "Sellotape" packing methods. Trained packing advisers will study your problem and put forward ideas for cost saving based on practical experience.

Industrial Division, 8-10 Paul St., London, E.C.2

For advice on any problem or further information ring BIShopsgate 6511

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DISPENSING BOTTLES
1-oz. to 20-oz.
RIBBED OVALS
½-oz. to 16-oz.
PLAIN OVALS
4-oz., 8-oz. and 16-oz.
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1-oz. to 8-oz. and 16-oz.
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OVAL TABLET BOTTLES
Nos. 1 to 7½ sizes.
ROUND SCREW JARS
Tall and Semi-squat.
PANEL FLATS
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VIALS
½-oz. to 3-oz.
RECTANGULAR TABLET BOTTLES
Nos. 1, 2, 3, 4, 5, 6 and 9 sizes

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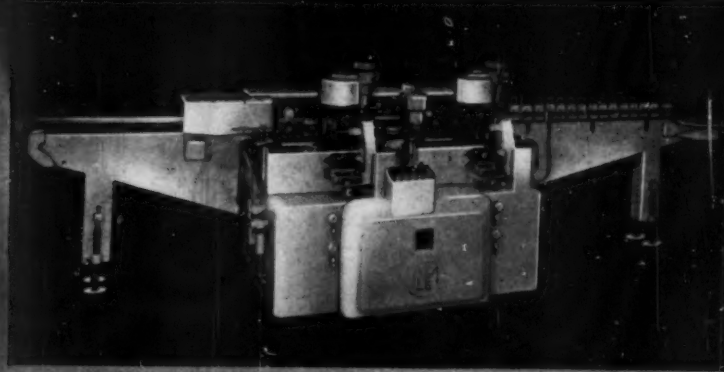
The Cyclone Duplex Flat automatic labelling machine is used by Messrs. Reckitt & Colman Ltd. for the high speed application of back and front labels to their Dettol bottle which is famous throughout the world.

The Banks labellers are also at work in 56 countries and in 250 towns throughout Great Britain. We manufacture 22 different models of the Banks labelling machine one of which may be just right for your application.



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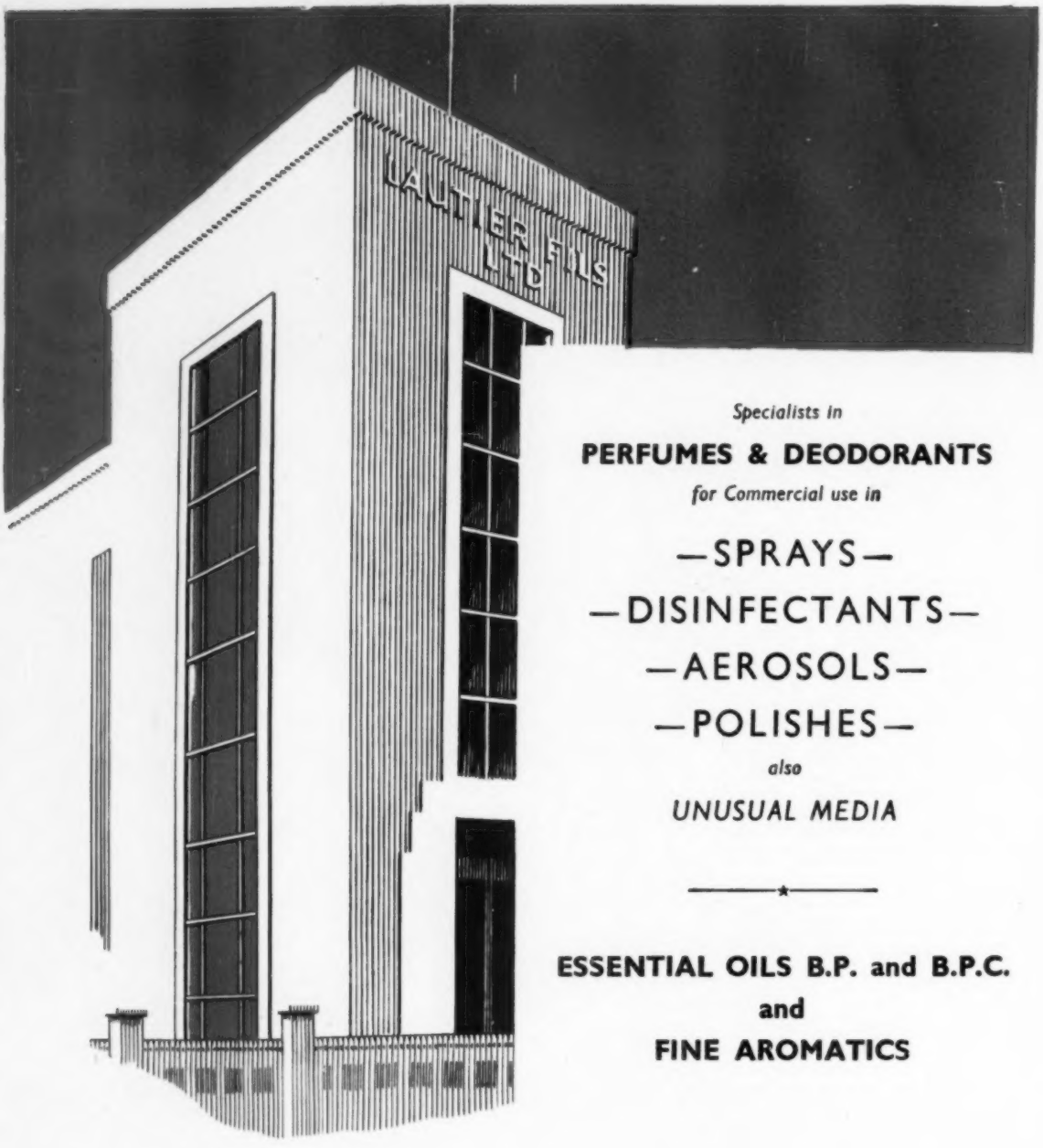

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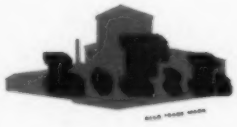

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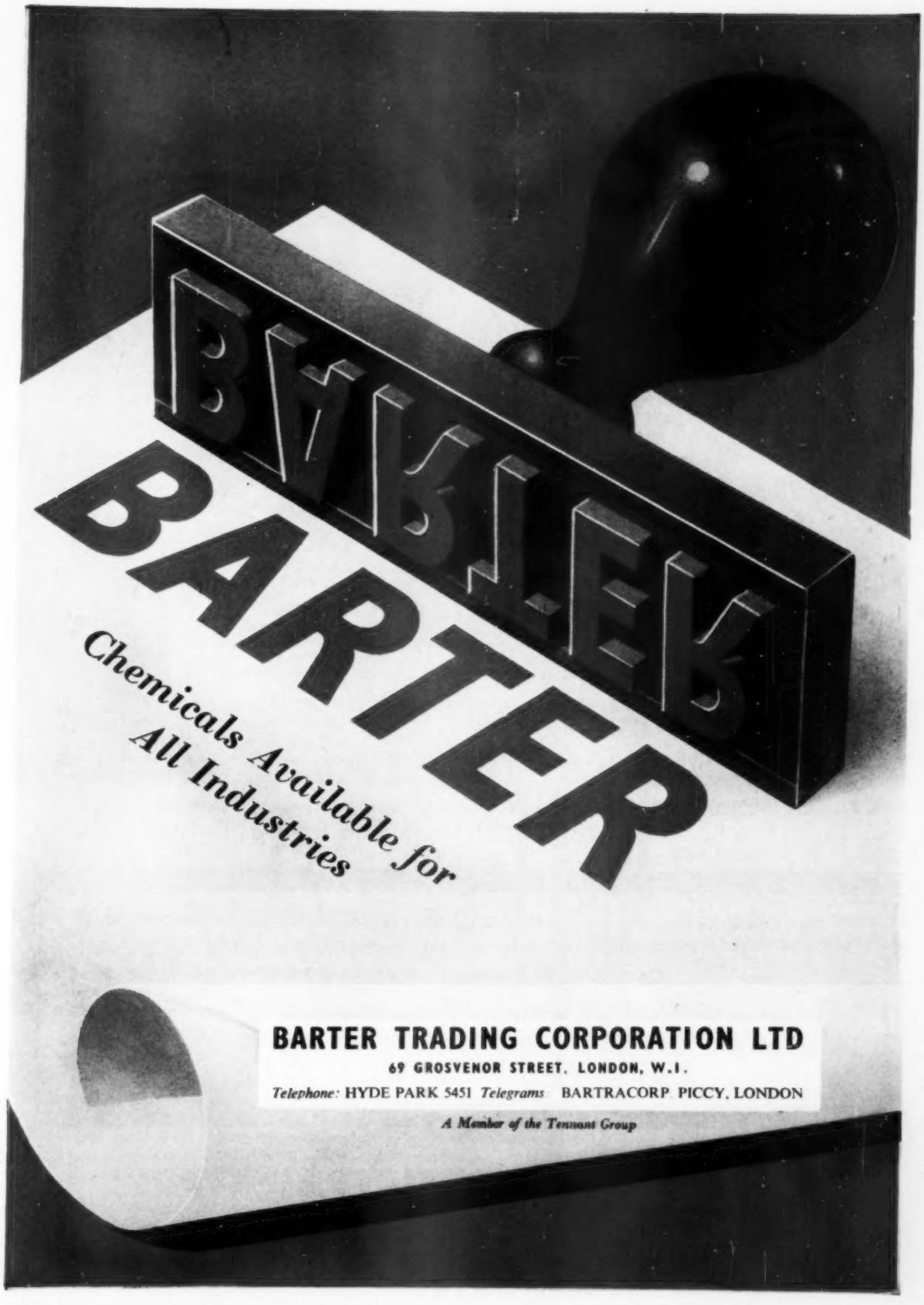
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RILEY service in your area

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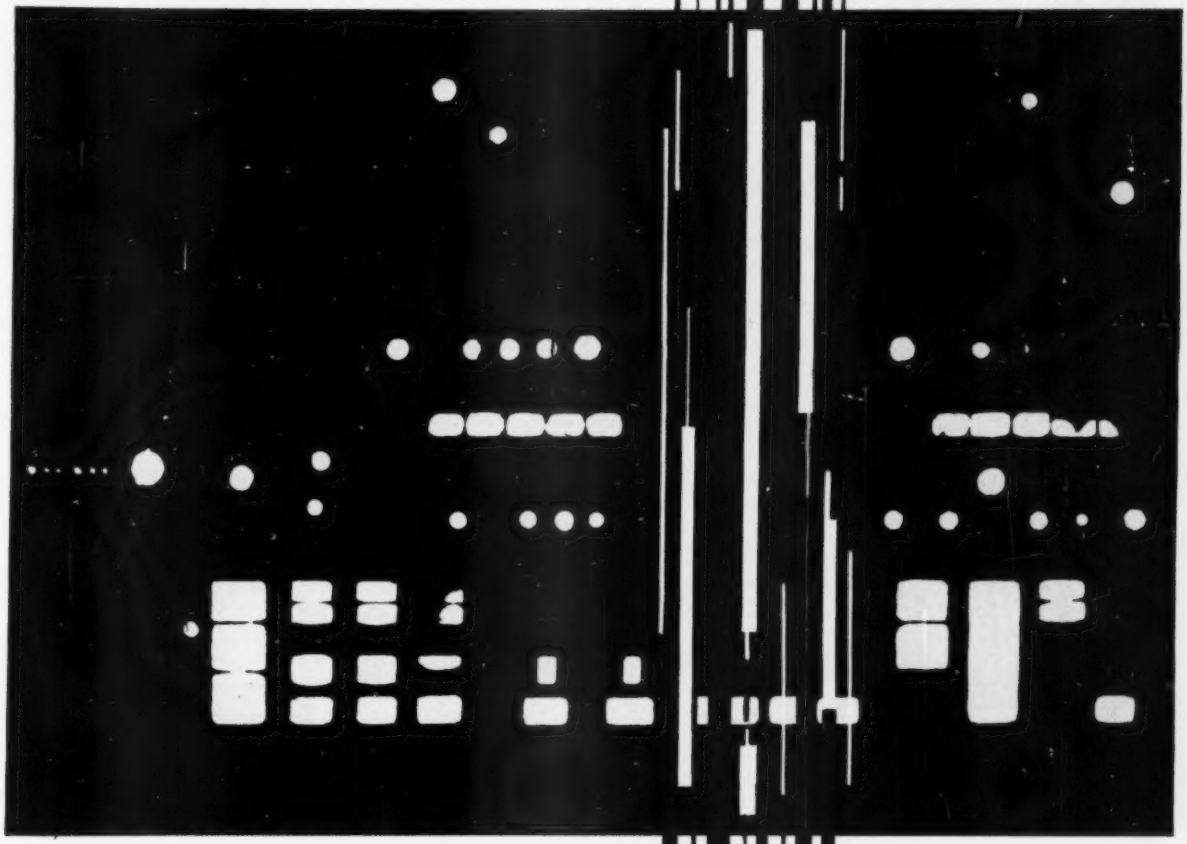
I.C.I. CARBON DIOXIDE GAS FOR INDUSTRY



I.C.I. supplies industry with high purity carbon dioxide in two forms:

For large users—

I.C.I. LIQUID CARBON DIOXIDE IN BULK is the cheapest method of buying carbon dioxide. There are no losses of residual gas, handling charges are eliminated, adequate stocks are easily maintained. Storage tanks of five-ton capacity are supplied by I.C.I. complete and ready for use, and I.C.I.'s rapid delivery service of liquid carbon dioxide means that vital work is never delayed.

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'DRIKOLD', solid carbon dioxide, and the 'DRIKOLD' LIQUEFIER give gas under pressure and ready for use. Only the net weight of carbon dioxide is handled—there's no heavy equipment to be lifted or moved. Once liquefiers are installed, pipelines remain connected—there is no coupling and uncoupling of lines. The liquefiers—usually supplied in pairs, to ensure continuity of gas supply—are simple to operate and each can give a discharge rate ranging from 8 cu. ft per minute to 70 cu. ft per minute. 100 lb of 'Drikold' will produce 875 cu. ft of gas measured at atmospheric temperature and pressure.

For both—

FULL TECHNICAL SERVICE is available. Help in the operation and maintenance of equipment and advice on all carbon dioxide problems is readily given.

Full information on request.

IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1

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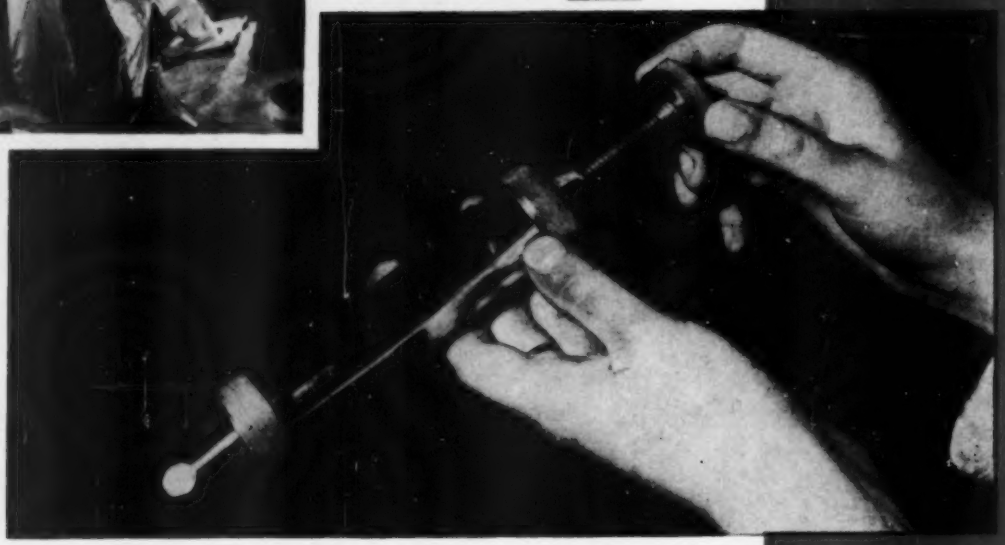
ASPIRIN AND PHENACETIN...

how Monsanto's technical service works for you

Monsanto



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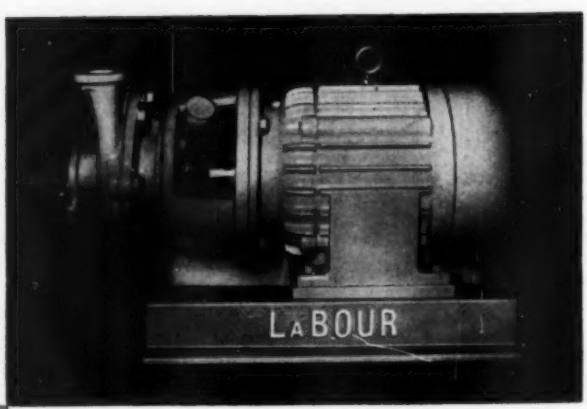

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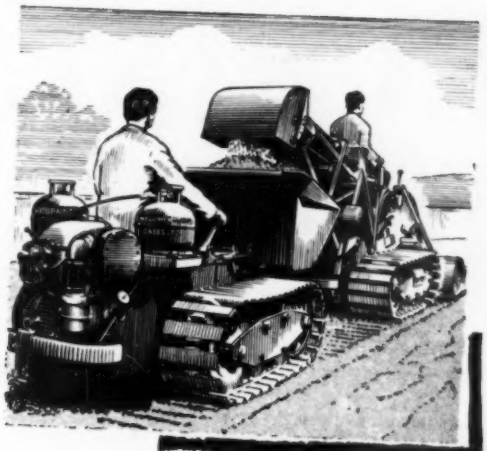

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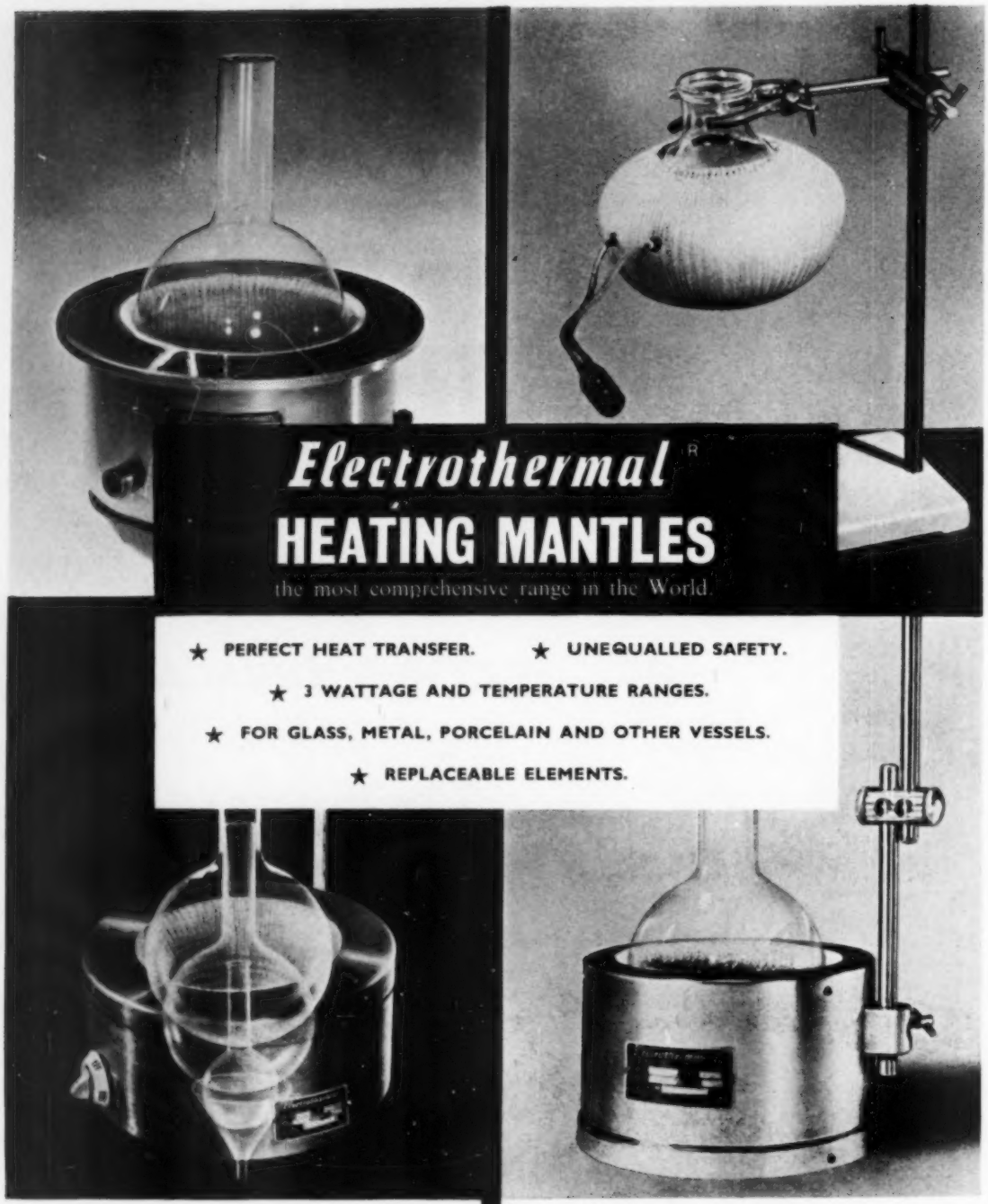

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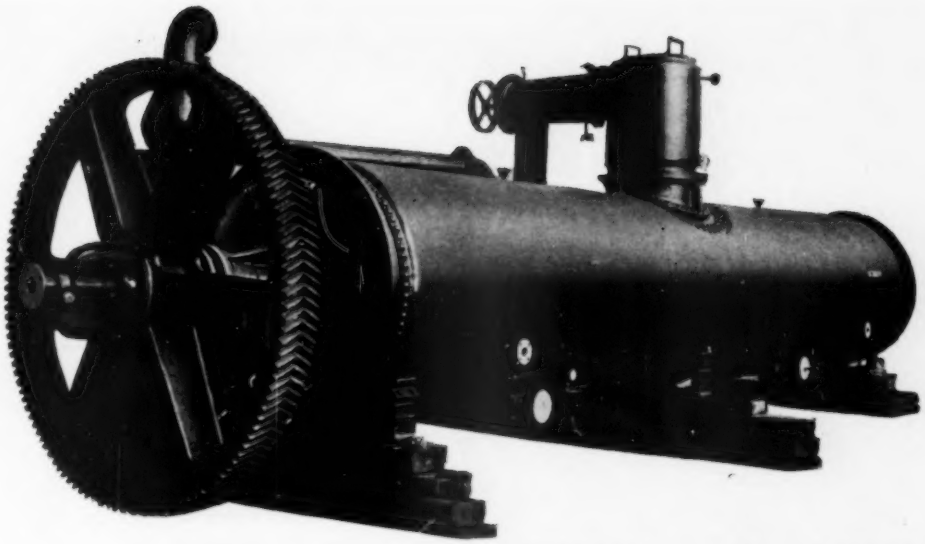

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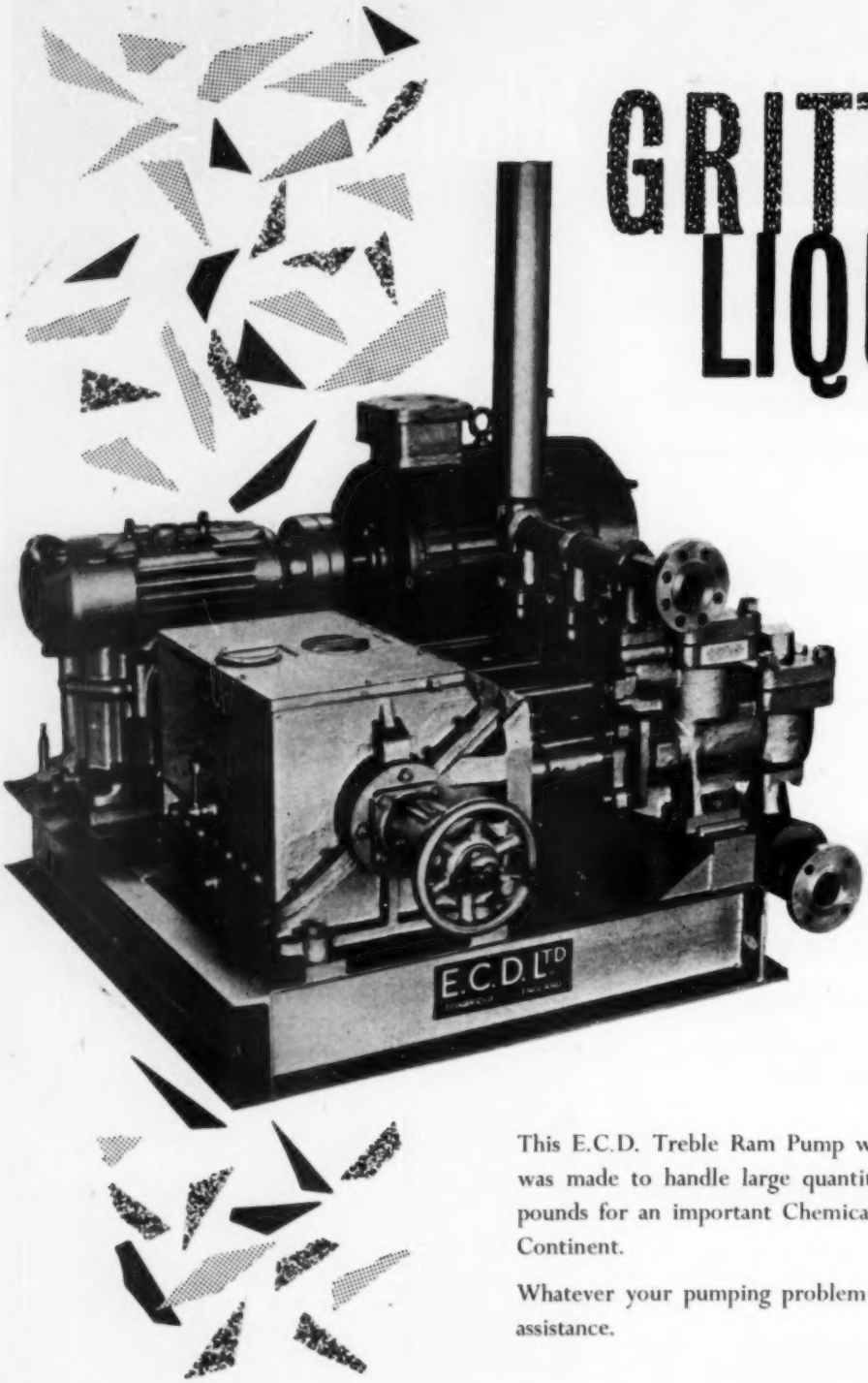

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Manufacturing Chemist

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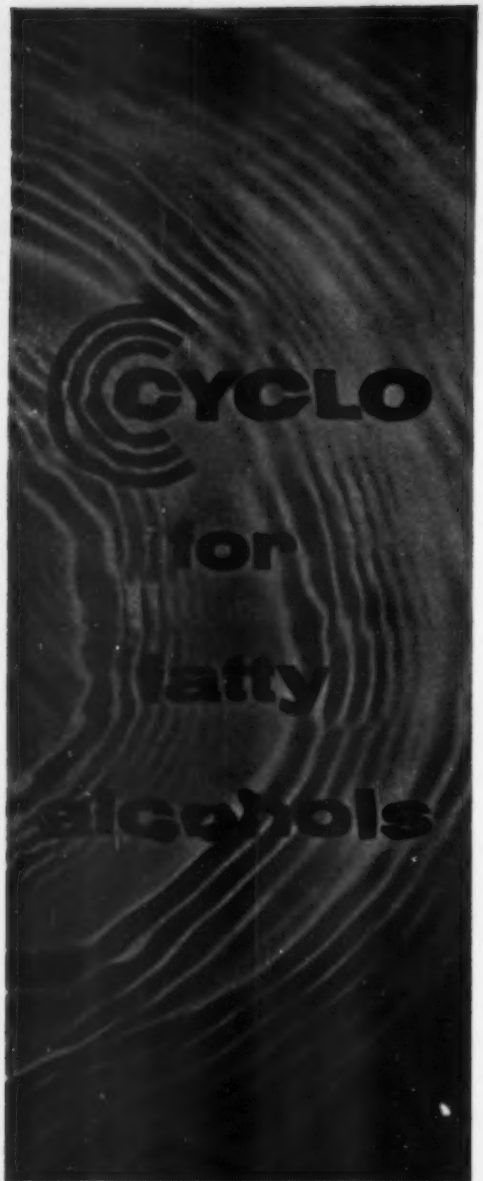

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TOPICS AND COMMENTS

Making science work

CAN there be such an animal as a Government policy for the application of science? *Apropos* the appointment of Lord Hailsham as Minister for Science and Technology, we expressed some doubt about this in our notes last month (p. 431). Now, that redoubtable pair Professors C. F. Carter and B. R. Williams of Manchester University have said that a policy cannot exist because "the facts on which such a policy should be based have never been collected." They make this statement, and many others just as blunt and provocative, in their new book "Science in Industry—Policy for Progress" which appeared last month (Oxford University Press, 21s. net.) This is the last book in a trilogy which has engaged the professors for several years. Their investigations have been sponsored by the Science and Industry Committee of the British Association, the Royal Society of Arts and the Nuffield Foundation. Two earlier reports, "Industry and Technical Progress" (1957) and "Investment in Innovation" (1958)—both written by the same authors—give the committee's conclusions on the facts. "Science in Industry" represents its concrete proposals to industry and the Government for policy and action to help in the fruitful application of science to industry.

According to Carter and Williams, Lord Hailsham should get away from generalities and set up a research group of scientists and economists to advise him on the formulation of a comprehensive national policy for science and technology. Research by such a group would make it possible to decide, for instance, whether aid to industrial science should be widely spread or concentrated and if concentrated whether most attention should be given to the weaker industries, or to those industries which have already proved successful.

But the professors' advice is not for Lord Hailsham alone. They have plenty to say to industry at large. They insist that industry should first of all think of what it can do for itself, and not expect all its troubles to be eased by the balm of Government action. In the first half of their book they give advice which should make self-help easier. Some of it is directed to small firms, but much is relevant to firms of all sizes. They put forward a set of general rules for deciding what kinds of research and development work are likely to be most worth while, and for making use of new ideas. One very important point they make is that quite often development work might already have been done, but that the ideas developed have not been applied. *Some industries could be transformed if what has already been discovered were more widely known and practised.* In our view this is just as true for the chemical and pharmaceutical industries as for technically backward ones. The fact that our industries are inherently scientific does not mean that every good idea has been exploited.

Of course many industries will find some of the suggestions in the book rather elementary. Chemical and pharmaceutical firms, for instance, will not need to be told that they should make check-lists of publications which might help in the quest for ideas, nor that they should send staff to specialist conferences. They should not need to be told, but do they do it? A standard procedure is set out for the larger firms trying to settle their budget and programme for research. It covers such points as the selection of projects which are capable of scientific solution and of being commercially worth while.

In further chapters the authors discuss the organisational difficulties of setting up a research department, and discuss ways of avoiding the dangerous tensions that arise between production and research staff. A final chapter on "What innovation requires from management" covers the effect of technical development on a firm's management structure, recruitment and training of staff. It includes some plain speaking on the danger, in family firms, of giving managerial positions to relations who do not justify them on merit.

Technical education, the provision of capital, restrictive practices by both management and labour, and taxation are other subjects covered in this meaty and stimulating book. It should be widely read and discussed by scientists and businessmen. It is hard to imagine any firm not profiting by it. Its implications for the nineteen sixties and beyond are enormous.

Confusion

NEW drugs and new variations of old drugs are being marketed at such a rate that doctors and pharmacists are in danger of being overwhelmed with names, doses, strengths and actions of a kaleidoscope of new preparations. This confusion could have serious consequences. Accidents due to the wrong dose or the wrong preparation being prescribed and dispensed are not infrequent. The pharmacist should always be the expert professional check on the doctor's prescriptions. But if he is as hard-pressed as the doctor to keep up to date the value of this safeguard is diminished.

In a recent issue of the news summary they receive from their public relations service, members of the Association of British Pharmaceutical Industry could read two related items. One was about a woman who died after an overdose of amphetamine;

the doctor had written on the prescription three grains instead of three milligrams. The chemist who filled the prescription said it did not seem out of the ordinary to him and, anyway, he was busy. The coroner commented: "The chemist is in the background and acts as protector-in-chief for the doctor who is careless."

The other item summarised a letter published in the *Pharmaceutical Journal* from Mr. W. A. Park, a member of the executive of the Scottish department of the Pharmaceutical Society, and a past chairman. He said: "The position with many pharmacists now is that not only is their shelf and cupboard accommodation severely strained, but so is their mental capacity to grasp names, doses, strengths and actions of these preparations. . . . I would suggest a "moratorium" of say six months whereby firms can consolidate their present products and establish their business on a more realistic and simplified basis, in the light of modern therapeutic developments without the adornments in the form of variations of compositions, strength, etc."

Would an agreement to stop the introduction of new preparations for six months in fact do any good?

It certainly would not if it were followed by the release of a pent-up flood of new preparations. No, for many reasons Mr. Park's "moratorium" would be impracticable. But this is no reason for manufacturers not to heed the sentiments he expresses which must be those of thousands of harassed pharmacists. Fewer new preparations and more standardisation would help everyone.

Welcome to Baskerville

We hope that readers will notice and approve of our new type face. For ten years we have been using Scotch Roman. Now we have Baskerville, a distinguished type-face beloved of book printers. Scotch Roman is a somewhat "black" face because of its thick descending lines; in fact it is somewhat reminiscent of Bodoni, a face which is excellent and versatile for display settings but seldom used for text matter.

In using Baskerville we return to a more elegant and more readable type. John Baskerville (1706-1775), the English printer who designed it, started life as a writing master and acquired a distinguished talent for calligraphy and for cutting inscriptions on stone.

Engraving on stone is, of course, the foundation of lettering design; many beautiful typefaces are derived from the lettering on the Trajan column in Rome, and a more modern English type designer, Eric Gill, was a sculptor and engraver on stone. Baskerville's contemporaries asserted that his lovely books owed more to the quality of the paper and ink than the type itself, but the popularity of Baskerville, two centuries after it was designed, shows that posterity does not agree with contemporary judgment.

Reform overdue

A minor but important reform of the National Health Service which is long overdue is removal of the ban on private patients receiving drugs on N.H.S. prescriptions. There was some hope before the General Election that the Conservatives, if returned, would remove this burden on private patients, but the Minister of Health was not encouraging when he replied to questions raised in the House of Commons on November 30. It seems quite unjust that people, not necessarily wealthy, who choose to pay for private medical attention should not be able to get their medicines free like the vast majority of the population who register with N.H.S. doctors. By paying taxes and health insurance private patients contribute their fair share to the financing of the Health Service. Why should their choice of private medical attention continue to carry the penalty of paying their own drug bills too? The present system of "all in or all out" is harsh and uncompromising and offends the public's sense of fair play. The Government must not be allowed to forget this.

Cancer chemotherapy

Since 1955 research on cancer in the United States has been co-ordinated by the Cancer Chemotherapy National Service Centre. Its biggest job is the screening of chemicals for anti-cancer activity. About 40,000 materials are screened each year of which fewer than two in 1,000 are deemed worthy of clinical trials. These are carried out on some 5,000 patients in 175 hospitals. This year about $100 million will have been spent on cancer research.

Undoubtedly the United States is putting more effort than any other country into the war on cancer. More than 100 chemical and drug manufacturers and research organisations are helping the C.C.N.S.C. Among them are Pfizer, Bristol Laboratories, Upjohn, Parke Davis, Abbott and Merck. Some companies have their own privately financed programmes, for example Lederle Laboratories, Burroughs Wellcome and Eli Lilly.

In a detailed survey of cancer research, *Chemical and Engineering News* (1959, **37**, (41), pp. 53-71) reports that so far there are about 20 anti-cancer drugs in general clinical use and about 100 in preliminary clinical testing stages. They fall into five groups: alkylating agents antimetabolites, hormones and steroid compounds, antibiotics and natural products, and miscellaneous, which includes urethane and colchicine and its derivatives.

The nitrogen mustards are so far the most hopeful of the alkylating agents. Phenylalanine mustard, developed in England by the Chester Beatty Research Institute, is marketed as *Alkeran* by Burroughs Wellcome. Another B.W. drug is *Myleran*, based on methanesulphonate esters. It is widely used clinically against some forms of leukæmia.

Among the antimetabolites, 4-amino-N^{10}-methyl

folic acid (*Methotrexate*—Lederle) is a key anti-cancer drug. Another widely used anti-tumour agent is 6-mercaptopurine (*Purinethol*—Burroughs Wellcome). A new development is 5-fluorouracil, which has some effect on certain solid tumours.

Adrenocortical hormones, such as hydrocortisone and prednisone and related steroids, are temporarily useful against some tumours, especially leukæmias. Gaining more attention are various fluoro steroids.

Tens of thousands of fermentation products are being screened for anti-cancer activity. Azaserine, made up of a diazoacetyl group attached by ester linkage to the amino acid, serine, has shown activity against animal tumours but low activity in humans. Actinomycin D is quite active against certain tumours, especially Wilms tumour, a kidney tumour found in children.

Success so far in the chemotherapy of cancer has been meagre. This is not surprising, for the term cancer covers more than 300 types of cell disorders. Some people think that the present massive screening programme is putting the cart before the horse and that more effort should be poured into basic biochemical research to try to discover exactly why cells run wild and develop cancers. Until the mechanism of carcinogenesis is understood, scientists are groping in the dark. What is clear is that a massive multiplication of research is the only way to conquer the most dreaded disease of modern man.

£5 million for new drugs

THE pharmaceutical industry is showing an encouraging disposition towards enlightened publicity designed to project a correct public image of itself and its activities. It has realised that a silent and secretive industry is at the mercy of unfriendly speculation and in the past decade the industry has had more than enough of hostile criticism. The latest effort of the Association of British Pharmaceutical Industry has been a survey of research expenditure. It will be recalled that in the report of the Hinchliffe committee on the cost of prescribing which appeared in May, the figure for British pharmaceutical industry research was estimated at £4 million a year, compared with £7 million in Switzerland and £43 million in the United States. The A.B.P.I. survey shows that there is an error of at least 25% in the estimate. In fact, last year A.B.P.I. members spent £5,053,146 on the development and discovery of new drugs. On this work they employed 1,200 graduates and 2,186 non-graduates. Even this total does not give the complete picture, because many companies are able to call on the research resources of their overseas associates, whether parent or subsidiary. In addition, £221,300 was given to independent organisations for the furtherance of medical and pharmaceutical research projects, from which the donors would not receive exclusive benefit. This figure does not include the munificent grants made by the Wellcome Trust which amounted to £400,000 last year.

It is clear, therefore, that the British pharmaceutical industry is supporting research at the rate of £5½ million a year—a figure that is better than many people expected and which is nearly twice as much as was spent in 1953. It would have been interesting but invidious to have known how many and which members are spending the money. Obviously a great deal of the total is accounted for by perhaps 10 firms. It would also have added to the interest of the survey if we could have been told the fields of research in which the money is being spent. Nevertheless the industry has made a good start in giving as much information as it has done and at this stage it would be unreasonable to expect more. We understand that the survey will be made an annual event. Perhaps more information will be forthcoming in the future.

To add to the impact of the survey the A.B.P.I. circulated the information to thousands of doctors, sending with it a reprint of that chapter of the Hinchliffe report dealing with research.

Textile softeners

ONE of the most notable developments in the American washing products industry in recent years has been the appearance of cotton textile softening agents on the retail market. It has been known for years that many fatty materials such as fatty alcohols or glycerides, impart a soft handle when padded on to cotton fabrics; however, the comparatively large amount—about 1% of the fabric weight—required to produce an appreciable effect and the difficulty of applying them under domestic conditions have precluded their use outside the factory. Some 20 years ago extensive researches by the Geigy and Ciba companies revealed that cationic surface-active agents containing at least one long alkyl chain are very effective softeners, and it is compounds of this type which are used in the new American products. The most favoured are the quaternary ammonium chlorides containing two hardened tallow chains, such as Armours' *Arquad 2HT* and General Mills' *Aliquat H-226*. Potential British manufacturers dubious about using tallow may note that the patent literature indicates chain length rather than chain composition as the important factor in determining softening ability in these compounds.

There is no doubt about the effectiveness of the cationic softeners. Applied from dilute aqueous solutions or dispersions they impart a characteristic, and very desirable, soft "limp" handle to all cotton fabrics, and have the further advantage that they increase quite remarkably the fluffiness of napped fabrics such as terry-towelling. Moreover they also confer very useful antistatic and bacteriostatic properties on the fabric. Above all, they are effective in extremely small amounts; the best compounds are reported to exert an appreciable effect when present at a concentration of only 0·025-0·05 per cent of the fabric weight. The reasons behind this striking efficiency are unfortunately as little understood as is

the concept of softness itself. It seems very likely that the powerful attraction of the negatively charged surface of the cotton fibre for the cationic leads to the rapid and extensive adsorption of the latter from solution. It has been speculatively suggested that this adsorption takes place in such a way that a monomolecular layer of the softener is formed on the fibre with the hydrocarbon chains being outermost; this would lead to a reduction of fibre-fibre friction by a process analogous to the boundary-layer lubrication phenomena so familiar to engineers and would thereby increase the pliability, and so probably the softness, of the fabric.

As opposed to all these advantages the cationic softeners have from the commercial point of view one serious drawback: they are obviously incompatible with the anionic surface-active agents used in all heavy duty detergents. It is therefore necessary to formulate softeners based on these compounds as individual products which are added separately in the rinse. Despite this apparent disadvantage the American products, of which *NuSoft* is the most prominent, have proved very successful. It seems that the housewife is after all not averse to using a really effective special duty product. British manufacturers please note.

The battle of Magenta

WHILE historians are commemorating the two "famous victories" of Magenta and Solferino of 1859, chemists may point to a more striking perpetuation of these names in a coal-tar dye which also made history. With the Austrians defeated and Italy saved, the French Marshal Macmahon was made Duke of Magenta, we are told. But the name survives better in the fuchsia-red dye "magenta" (or Rouge Solferino in Switzerland), which the French chemist Emanuel Verguin prepared by heating aniline, containing toluidine, with an oxidising agent. The new dye provided a splendid spur to the coal-tar dyestuff industry founded three years previously by the youthful Perkin. As a dye which could be produced by various oxidising agents and as a route to new dyes, it roused a battle of Magenta every whit as bitter as the struggle in history books; a discovery which brought many litigations in France and in Britain.

Like mauve or mauveine, magenta was partly due to the accidental use of impure bases prepared from coal-tar. It first appeared as a laboratory curiosity, a red precipitate of no particular note, until Verguin used stannic chloride to oxidise it and took out a patent for its manufacture. Later came other oxidising agents like arsenic acid used by Verguin and by Medlock and Nicholson in England, and mercuric nitrate used in the process of a Mulhouse firm. Since Keller of Mulhouse sold their magenta cheaper than Verguin's product, for which Renard Frères of Lyons had obtained a monopoly, there began a number of bitter lawsuits in which Renard sought to restrain the use of the rival patent of October 1859. But the Mulhouse firm not only prepared a cheaper magenta, which they named Azalein, but also licensed a Lyons company, Monnet and Drury, to manufacture it in face of the claims of Renard Frères.

In Britain magenta proved the first of the rosaniline group of brilliant dyes, though here as in France there were protracted patent disputes. The British dyestuff industry was to dominate the field because of the work of A. W. Hofmann and his pupils, the most famous of whom was Perkin, at the Royal College of Chemistry. Hofmann was somewhat chagrined to see the 18-year-old Perkin leave his pure research and, with no commercial experience, set up a factory for making the first coal-tar dye mauveine. But Hofmann soon came to appreciate the vast opportunities opened up by the industry Perkin created. Though Hofmann himself had prepared a laboratory specimen of magenta in 1858 the fact that others turned it into an important industrial dye need not have irritated him, since two of these were his former pupils, Medlock and Nicholson.

Nicholson took out a provisional patent for using arsenic acid as oxidising agent, only to find that Medlock had been granted a similar patent eight days previously. Yet E. C. Nicholson, the brains behind the firm of Simpson, Maule and Nicholson of London, not only saw his company take up the manufacture of "Hofmann's violets," which were methyl and ethyl derivatives of magenta, but added to his score the method of rendering dyes more soluble by sulphonation. In operating the arsenic acid process for magenta Nicholson discovered a by-product, a basic orange dye which Hofmann named Chrysaniline after he had fixed its composition. In 1862 at a lecture to the Royal Institution the inspired Hofmann exhibited a magnificent "crown of magenta," a mass of crystals worth £100, this being part of a vat containing over £8,000 worth. In those days such crystals were worth their weight in platinum.

On looking back on this centenary of magenta one sees a British school of organic chemistry in its heyday.

As we come to the end of our 31st volume—this is the 355th issue of MANUFACTURING CHEMIST—seasonal greetings are reaching us from our readers and advertisers. We are grateful for these messages which come from our friends all over the world—wherever English is spoken or understood. We wish all of them the age-old wish . . .

Merry Christmas and
A Happy New Year

VITAMIN PRODUCTS: Trends in Formulation and Presentation

By G. R. Wilkinson*

Stability and shelf life are two major problems in the manufacture of vitamin products and efforts to overcome them have led to ingenious developments in formulation, presentation and packaging. After reviewing these trends, Mr. Wilkinson summarises the current medical status of the major vitamins.

VITAMINS are now incorporated in products as diverse as toothpaste and pharmaceutical preparations, so considerable attention is being directed towards formulating and stabilising these temperamental materials because a shelf-life of at least two years is required.

The achievement of greater stability is the task of many teams of workers, but because it is such a highly competitive field the information generally appears only in patents and research papers from academic groups. Present trends can be detected in these patents and literature. For instance:

Spectrophotometric determination of the vitamin A content of 'Haliborange' tablets in the laboratories of Allen and Hanburys Ltd

Stabilisation methods

To stabilise vitamin A, 2,6-ditertiary butyl-4-methyl phenol, either alone or with butylated hydroxy anisole, has been used[1,2] for liquid products. Vitamin A has been produced as a stable powder. In one form synthetic vitamin A is combined in gelatin/sugar/starch beadlets to protect it from oxidation,[3] and in another a shell of a fat-insoluble substance[4] has produced a stable product. Alternatives are for transparent particles to be produced containing antioxidants, plasticisers—such as triethanolamine — lecithin and aluminium stearate,[5] or for the vitamin-containing oily liquid to be mixed with dry powdered synthetic calcium silicate gel.[6] These enable vitamin A to be presented in forms which could not otherwise exist.

The stability of vitamin B_1 in contact with various adsorbents for the production of dry powders has been studied[7] and decomposition was shown to be accelerated by some materials. A new salt has been found; aneurine methylene bis-β-hydroxynaphthoate, which is unexpectedly stable in the presence of moisture,[8] and difficultly water-soluble salts have also been produced.[9]

Some attention has been concentrated on vitamin B_{12} on its own and in association with the other B vitamins and with other vitamins.[10-17] At present the picture is very confused.

With vitamin C the story has been the same[18, 19] and is complicated by the self-destructive nature of aqueous solutions. With vitamin D stabilisation has been attempted along the lines of those for vitamin A.[20]

Formulation

Many of the formulation problems have been caused by the tendency to change from the older idea of presenting vitamins in simple or in associated combinations (e.g. A and D together) to formulations where the natural components of a group have been standardised, and the further development where a number of vitamins are included together with, in some cases, minerals, so producing a complete diet adjuvant. These products also provide a means of giving a group of vitamins where all are lacking, due, for example, to illness or to living on a mainly carbohydrate diet due to laziness, ignorance or poverty. They are also useful where the vitamin demand is increased, during pregnancy for instance. These developments have raised a number of problems which have not yet been overcome. Progress is being made in the direction of products which are sufficiently stable during long storage and which in most cases incorporate overages to allow for a certain amount of deterioration. To improve stability, methods of presentation which assist in slowing down the decomposition of the vitamins have been devised.

Oral vitamin products

Vitamin products, like other pharmaceuticals, may be classified

* Allen and Hanburys Ltd.

roughly by the form of presentation. The accompanying table of products is therefore divided into "orals" and "injectables." It is a selective list and is by no means comprehensive.

Liquid oral preparations consist generally of vitamins dissolved or solubilised in vehicles containing large proportions of sugars, sweetening agents and flavours, together with appropriate solubilisers and stabilisers. These are the elders of the vitamin family, and although they are being superseded by newer types of preparation they still sell well. Their advantages include the ease with which they can be given to babies and the simplicity of preparation when concentrates from natural sources are included. With these products, where the vitamins are in intimate contact with each other and with other materials, decomposition can be rapid.

Tablets

On the other hand, vitamins in tablet form are dry and if protected from moisture decomposition is slow. If it is necessary to separate them completely, as in the case of some mineral inclusions, coating may be resorted to and the vitamins and minerals may be divided between the core and the coating which may be applied by pan coating in sugar or by the Drycota or Prescoter techniques. If this is not satisfactory the various components of the product—vitamins and minerals—should be compressed in separate tablets; the dose is then one tablet of each type.

Capsules

Gelatin capsules range between liquids and tablets. In capsules the ingredients are kept separate by being coated with a film of fat and are further protected by the gelatin shell as long as the capsule is not exposed to excessive humidity. At times the vitamins may migrate into the shell or the mineral inclusions may cause tanning and hardening of the shell. This may or may not be a bad feature, depending upon the product. Oily solutions of fat-soluble vitamins are ideally packed in capsules, as these mask the unpleasant taste, and they can be produced in many shapes and colours for easy recognition or for consumer appeal.

Pellets and injectables

The latest form of presentation of unit doses of oral vitamins is pellets, in which the vitamins are homogenised in a flavoured hard-toffee base and tableted. In this way the vitamins are protected and stability is improved. They are pleasant to suck and are ideal for children.

Injectable vitamin products, particularly those containing B vitamins, cause most trouble. Because of considerations of toxicity, pyrogenicity or actual tissue damage on injection the choice of stabilisers is limited. So that stabilisers can be avoided as far as possible some producers have gone to enormous lengths to produce stable products and these can be illustrated by a single example. *Bejectal* C with liver[21] is packed in a special vial designed to separate the liver extract and some of the vitamins. Before use the cap is pressed, removing a plug between two sections of the vial and allowing the liver extract to mix with the solid vitamins. The vial can then be used in the normal way for injectable products.

Packaging

From the point of view of shelf-life, cost and customer appeal, new methods of packing are constantly being considered. Once a simple bottle or tin was the usual pack, and although these are still widely used, much more attention is being paid to their appearance as well as improving the protection afforded to the product. Vials with tightly fitting polythene stoppers are replacing bottles with plastic screw caps and extruded aluminium containers are vying with tins. These new packaging trends originated in the U.S.A. and Mead-Johnson's *Natalins*[22] provide an example. These are pre-natal and vitamin mineral tablets "designed to project the somewhat divergent connotations of pharmaceutical achievement and femininity." They are packed in a glass container, the shape of an Ehrlenmeyer flask, closed by a plastic screw-cap which "symbolises the rôle of research in the development of pharmaceuticals, and for feminine appeal, a ceramic lace decoration in white is silk-screen printed round the bottle neck."

Plastics are used by Neutrilite Products (Inc.), California,[23] whose products are packed in a polythene-film bag which is then placed inside a moulded polystyrene box. The bags protect against moisture and the box is an attractive container with re-use value.

Another novelty in the U.S. is the *Vi-Daylin* push-button pack.[24] The product is packed in a container pressurised with non-mixing nitrogen. By pressing the valve the viscous product may be released through the spout into a teaspoon in a controlled non-drip flow. This pack is expensive but convenient.

Strip-packing, both in metal foil and transparent film, are gaining in popularity for vitamins as well as other products. Not only is the product protected until the moment before it is taken, but capsules or tablets may be displayed if the wrapping is transparent. The transparent metal films or laminates provide considerable protection against moisture, but the transparent films are only suitable for conditions of relatively low humidity.

Medical status of vitamins

As in all systems where living tissue is concerned, the rôle of vitamins is still only partly understood and their status is constantly changing as more information becomes available.

The present status of vitamin A is a good example of partial understanding. Most of our knowledge is concerned with the small amount (about 0·05 to 0·1% of the total) which is present in the eyes as rhodopsin or visual purple, whereas little is known about the actions of the rest of this vitamin dispersed throughout the body, particularly in the liver. Rhodopsin consists of the protein opsin combined with vitamin A aldehyde which is produced from vitamin A by the retinal rods, and there is no evidence that rhodopsin or retinaldehyde is present anywhere else in the body, although retinaldehyde has been identified in certain fish eggs.[25] For many years the idea of ingesting vitamin A or carotene has been put forward as a cure for night-blindness, but recent efforts have shown that vitamin A acid, although it can promote growth in vitamin A - deficient rats, has no effect on their reduced vision in the dark.[26] When this material has been further studied it may lead to better understanding of the role of vitamin A.

In a study dealing with vitamin A deficiences in African natives[27] it has been demonstrated that very low vitamin A blood levels in humans are not necessary before therapy can be beneficial, although the assessment of results is extremely difficult. Cases concerning hypervitaminosis A have occasionally been reported in the U.S.

A Selection of Current Vitamin Products

Product	Composition																	Form of product
	A	*B_1*	*B_2*	*B_3*	*B_6*	*"B Complex"*	*B_{12}*	*M*	*C*	*D*	*D_2*	*E*	*K*	*Nicotinamide*	*Nicotinic acid*	*Inositol*	*Choline*	*Minerals*	*Other inclusions*	
Abidec	★	★	★	★	★				★	★				★						Liquid or capsules
Adexolin...	★									★										Liquid or capsules
Aronal	★									★										Toothpaste
Befortis						★														Liquid
Bemax						★														Flakes
Benerva		★																		Tablets
Benerva Compound ...		★	★											★						Tablets
Beplex		★	★	★	★									★						Capsules
Brewers Yeast						★														Tablets
Complivite	★	★							★									★		Tablets
Cytacon							★													Liquid
Delrosa									★											Liquid-syrup
Farex						★														Flakes
Ferraplex						★			★									★		" Capsule-shaped " tablets
Haliborange	★								★	★										Pellets or liquid
Hewferro						★												★		Tablets
" Vitaminised " Iron Jelloids						★			★									★		Tablets
Lederplex		★	★	★	★		★	★						★		★	★			Liquid
Metatone		★																		Liquid
Minadex	★									★								★		Syrup
Multivite...	★	★							★		★									Pellets
Natalins	★	★	★	★	★		★	★	★	★				★				★		Capsules
Nestrovite	★	★							★	★										Emulsion
Pernivit															★					Cream
"													★		★					Tablets
Phillips Yeast						★														Tablets
Vitamin A-D Cream (Coty)	★									★										Cream
Redoxon									★											Tablets
Ribena									★											Liquid-syrup
Supavite	★								★	★		★								1 Orange Capsule
"		★																★		1 Black Capsule
Virvina						★														Liquid
Vykmin	★	★	★		★													★		1 Red Capsule
"																				1 Black Capsule
Ascorvel									★											Injectable
B-100 Complex		★	★	★	★									★		★	★			"
B-ALL LEO		★	★	★	★		★							★						"
B-Complex Liver Extract (Squibb)		★	★											★						"
B-Complex (Glaxo) ...		★	★	★	★		★							★						"
B-Complex (Ankermann)		★	★	★	★									★						"
B-Vitamins (Complex)		★	★	★	★									★			★			"
Bejectal, Solution 1 ...		★			★															"
" Solution 2 ...			★	★										★						"
Bejectal C with Liver ...		★	★	★	★		★		★					★			★			"
Betalin Complex ...		★	★	★	★									★						"
Calcium-C									★									★		"
Calcium Glucono-ascorbate									★									★		"
Cytexin*...		★	★	★	★		★							★						"
Cytexin forte*		★	★	★	★		★							★						"
Dacecal	★								★		★							★		"
" Dohyfral "—B-Complex		★	★	★	★									★						"
Eubeco		★	★	★	★									★			★			"
Histidine-C									★										Histidine HCl	"
Hypobeta		★	★	★	★									★					Liver Extract	"
Redoxon Ampoules ...										★										"
T.C.F. Vitamin B-complex		★	★		★									★			★			"
Thiaride Complex ...		★	★	★	★									★						"
Vitamin B-Complex ...		★	★	★	★									★			★			"

* =Dry powder for reconstitution.

The status of vitamin B_1 has not changed over the past few years. Its curative and prophylactic effect on beri-beri is well known, and although the study has been extended to other diseases no important findings have been published.

Attempts have been made from time to time to relate the riboflavine requirements of man to energy expended, and since 1950 the suggested level has been tentatively set at 0·6 mg/100 calories. The relationship has recently been confirmed.[28]

Nicotinic acid has also been closely studied and recently a report has been issued concerned with sustained lowering of serum cholesterol levels in patients taking large doses.[29]

A relationship has been established between the " burning feet " syndrome reported by prisoners of war in Malaya and a vitamin deficiency. Claims are made that small doses of pantothenyl alcohol bring about rapid improvement,[30] although other workers suggest that this deficiency is not the cause. A minor use has been found in the stimulation of post-operative intestinal motility.[31] It has also been shown that seborrhœic dermatitis in children is probably due to a deficiency of biotin.[32]

The effectiveness of B_{12} in pernicious anaemia is well established and attention has been directed towards other conditions which might be influenced by vitamin B_{12}.

B_{12} deficiency is thought to be a factor in the development of peripheral neuritis in chronic alcoholics, in diabetes mellitus (especially when retinopathy is present) and in tabes dorsalis, and it is also said to have some association with trigeminal neuralgia and herpes zoster.[33]

The purposes for which vitamin D can profitably be employed are still far from clear, and although it is still considered to be essential for the deposition of bone calcium phosphate, it also appears to influence the amount of calcium absorbed from the alimentary tract and the amount of phosphate reabsorbed by the tubules in the kidney. Further possible functions are suggested in recently reported work.[34] In the muscles of vitamin D-deficient rats there is less adenosine triphosphoric acid than in controls, whereas in rats on a diet with a large surplus of vitamin D there is an excess. Using radioactive materials an unidentified substance has been shown to be absent in rachitic rats which appears within 2 hr. of giving them vitamin D.

A new plant for the manufacture of vitamin A at the Ulverston factory of Glaxo Laboratories Ltd. Constructional materials are chiefly glass and stainless steel.

This material is believed to be the precursor of bone calcium phosphate.

Attention has been drawn to the possible relationship between malfunction of the adrenal glands and corticosteroid metabolism in conditions of scurvy. Whereas in normal guinea-pigs no serum corticotrophin was found, considerable amounts occurred in scorbutic animals and this could be reduced by the administration of ascorbic acid.[35] This work, together with that showing an increase in cholesterol in the blood of man and guinea-pigs under similar conditions,[36] suggests a possible relationship between steroid synthesis and ascorbic acid metabolism. Ascorbic acid appears to play a part in collagen synthesis, as fibroblasts *in vitro* will catalyse the conversion of C14 labelled L-proline to collagen containing hydroxyproline. In studies on skin regeneration it has been shown[37, 38] that impaired hydroxyproline formation may be one of the earliest signs of ascorbic acid deficiency. In scurvy there is a change in the concentration and nature of plasma proteins, but the increase in alpha-globulin is not specific.[39]

Vitamins A and D are now being used in cosmetic products[40] and toothpaste,[41] but the reasons for their inclusion are somewhat obscure.

It is now clear that a deficiency of water-soluble vitamins is encountered more often than with the fat-soluble group, and it is possible even with a normal diet to develop a sub-clinical vitamin deficiency. This is particularly true of vitamin C, which is largely destroyed during cooking, so there is good reason for a daily intake as a dietary supplement.

In the case of children who are growing rapidly, the demands for vitamins may exceed those available in a normal balanced diet, and for this reason pædiatric preparations for these conditions are now available.

Since the tonic dose of the vitamins is very considerably higher than the daily intake it has become common practice to take vitamins for a number of non-specific ailments, and a considerable amount of advertising is directed towards their use as tonics and prophylactics.

It has again been suggested that the time has come for the term vitamins to be discarded, since they may be vital in some sense but are not amines. They are food factors or sometimes drugs, and they should be treated with the respect due to them.

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(Continued on page 503)

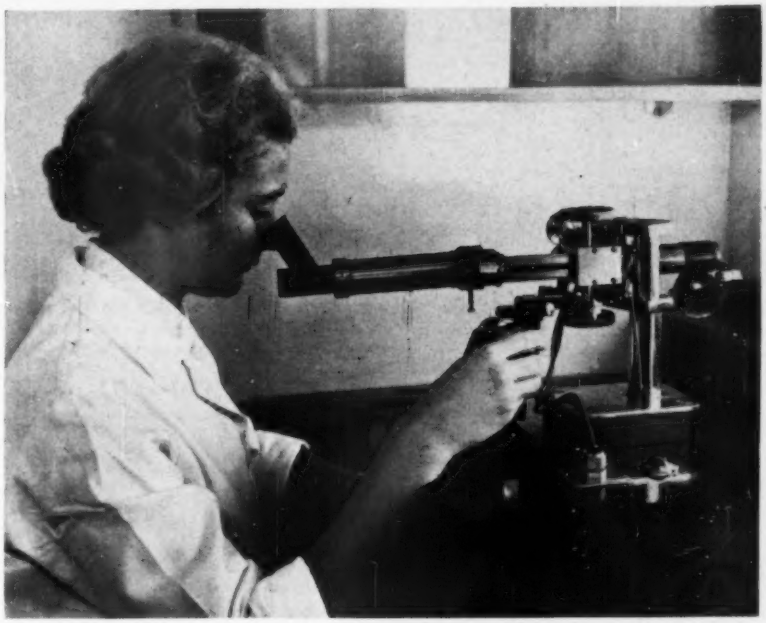
Research Objectives at Boots' New Laboratories

The opening of their new laboratory building in Nottingham marks a new phase in Boots' research efforts which embrace pharmaceuticals, veterinary medicines and agricultural and horticultural products. The company is now spending at least half-a-million pounds a year on research and this budget is likely to be increased.

THE NEW research laboratories that Boots Pure Drug Co. Ltd., have built in Nottingham symbolise their determination to engage even more vigorously in pharmaceutical and related research. The 88,000 sq. ft. laboratory block cost £750,000 to build and equip, but it is still not big enough to handle the company's total research effort. Chemical, antibiotic and agricultural and horticultural research is carried on in existing laboratories and field stations in Lenton, Thurgarton and Nottingham.

The new building houses research on pharmacology and chemotherapy and the analytical and control work of the bioassay and microbiology divisions of the Standards Department. It also accommodates the medical department, the central library of 15,000 volumes and the headquarters of Boots' director of research, Dr. G. I. Hobday. It also contains a handsome lecture theatre to seat 200.

Pharmaceutical research on the scale now envisaged is a new policy for Boots. Before the war research was exiguous, but since 1946 it has been expanding rapidly. In the past three years there has been a 25% increase in the graduate research staff and there is space in the new building for a further increase of 50%. Boots' research budget is now at least £500,000 a year and it places the company among the leading research organisations in Britain.



A microforge constructed in the company's laboratories to make the fine glass instruments for the micromanipulators used in the chemotherapy division of the research centre.

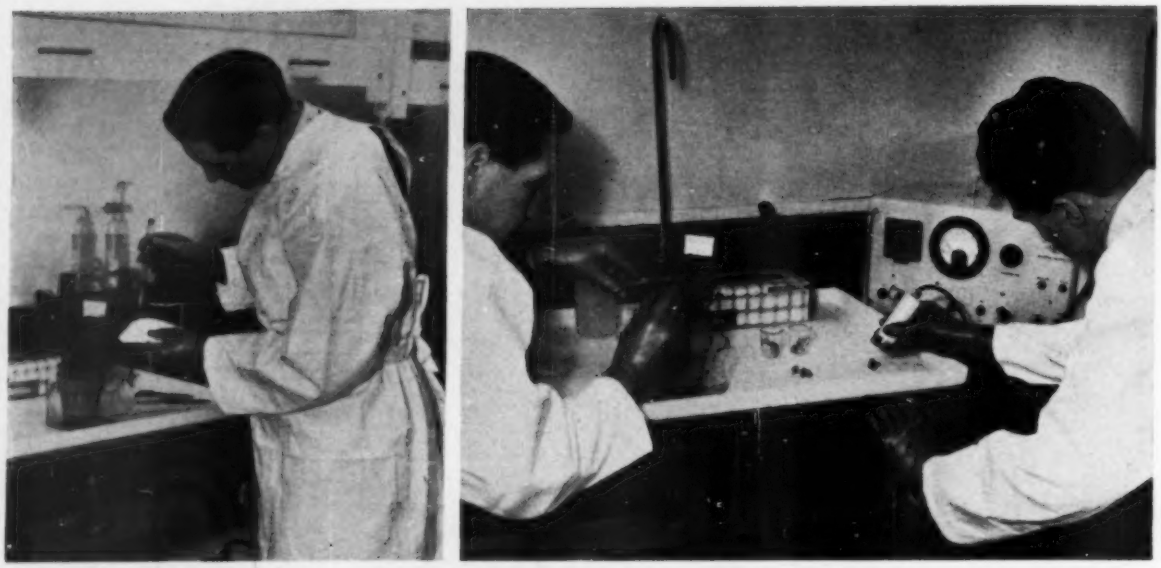
Design and layout

The new building, which was designed by Boots' architectural staff under the direction of Mr. C. St. C. Oakes, chief architect, is sited in Pennyfoot Street, Nottingham, a short distance away from the chemical manufacturing plant but near enough so that services such as steam, electricity and water are drawn from the central works supply. It is near to the present chemical and biochemical research laboratories and immediately adjacent to the site on which these facilities will be rehoused within the next few years. In plan the building is in the form of an irregular H; one wing of four floors houses administration offices; medical department, library, canteen, conference room and the fully-equipped lecture theatre. The linking block contains the main staircase and lifts together with lavatories and cloak-rooms. The other wing, longer than the first and on seven floors with a basement, is entirely devoted to laboratories.

The building is of striking appearance. One wing is of brick and the other is faced with ceramic tiles in a checker-board pattern of grey and yellow. In internal design the administration wing and linking block are fairly conventional, but features of special interest include the pre-stressed concrete main staircase and the undulant ceiling in the canteen. The lecture theatre, which is acoustically designed, is fitted with stackable chairs which can be removed entirely to free the floor space for exhibitions, etc. Also to be noted is the pleasant medical and biological library, the stack room of which is fitted with mechanically operated stacking to save floor space. The décor throughout is modern, but not aggressively so, using mainly monochromatic treatments and avoiding disturbing colour contrasts. In the entrance lobby is a large colourful mural, abstract in design but intelligibly depicting the scientific disciplines provided for in the building.

Chemotherapy

The top two floors of the laboratory section house the chemotherapy division. Special precautions have to be taken to safeguard workers and the community in general. Animals are housed in cages where the flow of air from room to cage to exhaust duct prevents any possibility of infection



Isotopes laboratory. Left: An experimental weedkiller containing a radio-active "label" is applied to the foliage of cleavers. Right: Four days after application foliage clippings are tested with a radiation monitor to determine the movement of the compound within the plant.

being transmitted from the animals.

Subjects under examination in the chemotherapy division include the chemotherapy of diseases produced by viruses, bacteria (including antibiotic-resistant strains of the staphylococci), protozoa and helminths. This involves the testing of new synthetic compounds prepared by the chemistry division of the Research Department and new antibiotics prepared in the antibiotics and fermentation division at Daleside Road, Nottingham. Tuberculosis is being studied in the knowledge that present treatment of this disease still has drawbacks. In the virus section, however, emphasis is concentrated more on fundamental studies than on screening work. The objective is to study the fundamentals of virus physiology—how viruses grow and why. Attempts are being made to find antagonists to amino-acid uptake which is responsible for virus growth. Beta-threo-phenyl serine has been found active against the influenza virus on tissue culture.

Work on tropical medicines started at Boots ten years ago. A new prophylactic against bovine trypanosomiasis is *Prothidium* which at a dosage rate of 2 mg. per kg. bodyweight protects animals for five months, a considerable improvement on existing prophylactics.

A concentrated effort on human amœbiasis involved the testing of 11,000 compounds in 16 months. A new drug, *Entamide*, has proved effective in this disease and others are promised.

Pharmacology

Since the pharmacology division is concerned with non-infectious diseases the accommodation for animals is simpler than in the chemotherapy division. Pharmacological topics under investigation include rheumatism, analgesics, diabetes, atherosclerosis and coronary artery disease. Fields where new drugs are being sought include bronchodilators, diuretics, analgesics and hypnotics.

A problem in rheumatism research is the impossibility of inducing the disease in animals. A partial solution is to shave guinea pigs and to expose them to ultra-violet light to induce erythema. They are then treated with aspirin and phenylbutazone derivatives and other possible anti-rheumatic substances. The effect they have on the erythema is a guide to their activity in humans.

A considerable amount of time is spent on routine toxicological examinations of both drugs and pest control products. Even chemical intermediates are tested to evaluate their hazards to operatives during processing.

Standards department

On the first and ground floors are those divisions of Boots' standards department analogous to the chemotherapy and pharmacology divisions outlined above. The microbiology division of the standards department is responsible for the bacteriological control of sterile products manufactured by the company, for testing and controlling the activities of disinfectant and antiseptic preparations and for the microbiological assay of antibiotics and certain vitamin preparations. The bioassay division is also concerned with assays which cannot be done by chemical or physical means, the most important being that of insulin. Although insulin has been available since 1926 its assay is still of necessity done biologically. Boots use 700 mice a week at 1s. 6d. each for bioassay. They prefer to use males and buy all supplies from one breeder. They do not breed animals themselves. It costs £85 to test each batch of insulin (475 litres).

Sulphated ox blood is used for heparin assay which is based on the power of heparin to delay the coagulation of blood, the delay being proportional to the amount of heparin present.

Another job of the bioassay division is the determination of the knock-down effect of pyrethrum-based fly sprays.

Isotope unit

Since the isotopes used in the isotope laboratory are of compara-

(Continued on page 496)

Chemical Pumps

By W. F. Riester, Dr.Ing., M.I.Mech.E.

Dr. Riester summarises the advances that have been made by pump manufacturers in providing the special features necessary for chemical pumping duties and discusses briefly some notable developments as well as some needs which have not yet been satisfactorily met.

In recent years there has been a significant commercial development in the pumping field. Some manufacturers in Britain, having noted the existence of a large and growing market, are now offering a range of pumps, which are advertised as "chemical pumps." Such pumps, of the centrifugal single-stage type, are now made in batches for stock, mostly in 18/8 stainless steel, and can therefore be suppled at very reasonable deliveries and prices. Manufacturers in Britain thus follow the trend in the U.S.A. and Germany where a number of pump makers have for some time catered exclusively for the demands of the chemical and process industries with complete ranges of stock-produced pumps.

There have also been, of course, quite a number of makers in Britain who took pride in offering chemical pumps, but their ranges were limited and restricted to special materials, such as silicon iron, stoneware, rubber, plastics, etc., or they consisted of only a few types of very special construction.

It would appear that in all Europe there is only one manufacturer, in Germany, who consistently for over 40 years has supplied pumps to the chemical industry only on a large batch production basis and who refuses to quote for water pumps. It is evident that a wealth of most valuable experience is bound to accumulate in any such firm supplying tens of thousands of chemical pumps over many years, which again by necessity must have been accompanied by misapplications, disappointments and troubles.

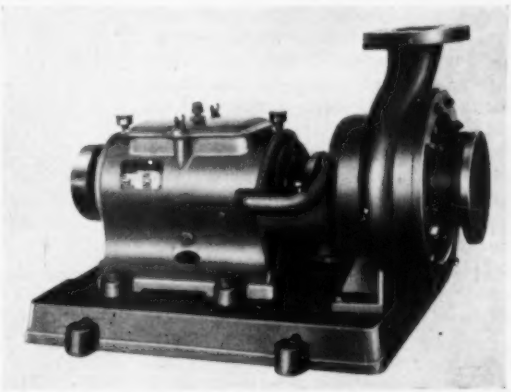
One may look forward to the day when in Britain, too, a manufacturer will abandon water pumps and will concentrate solely on properly designed chemical pumps. Up to only a few years ago, a pump made of materials other than cast iron or bronze was termed "special" by a maker who predominantly dealt with water-pumping problems, with all the disadvantages—both for maker and user — resulting from such treatment as a "special."

Features of a chemical pump

If there is such a thing as a "chemical" pump, what are its features? Surely it cannot be satisfactory simply to use a design developed for pumping water and make it of corrosion-resisting materials. Books published dealing with pumps are not very explicit on this matter. The following features may be set down:

(*a*) Simplicity of design.
(*b*) Suitable materials for wetted and other parts.
(*c*) Minimum of leakage points (joints or glands).
(*d*) Capability of dealing with vapour and solids inclusions.

The above apply to all types—centrifugal, reciprocating and rotary —and are dealt with in more detail below.



Rheinhuette 'RE' pump uses a ring valve operated by a centrifugal device (Conveyor & Equipment Co.).

Simplicity of design

This refers mainly to simple patterning, to facilitate casting of difficult materials. Hydraulic and mechanical efficiency may have to be sacrificed. Open or semi-open impellers are preferable to fully shrouded types. Machined surfaces should be a minimum, as should also the number of components. A maximum number of parts should be interchangeable in a range of pumps, *i.e.* three or four different casings should fit one bearing pedestal, with shafts, sleeves, glands, and impeller nuts the same for all types of this group. This will reduce stocking of spares and ensure quick servicing. All parts should be easily accessible by a few quick manipulations. Many makers supplying the chemical industry now provide pumps with all, or some, of these features.

Use of suitable materials

Corrosion problems in pumps are often of a complex nature. Not only the liquid pumped and its temperatures, but often also the concentration and presence of oxidising agents, such as air, steam or others, must be taken into account.

The primary factor controlling corrosion is the tendency of the metals to dissolve electrolytically in the solution pumped. Surface homogeneity is next in importance, *i.e.* avoidance of cracks, scratches, inclusions, rough machining marks, etc. Also the ability of the metal to generate a self-protecting film is of great value. Other factors are involved, such as hydrogen ion concentration, oxygen distribution on the metal surface, the effect of high velocities along the surfaces, impurities present, stress variations in the metals, etc.

A most valuable guide, known to every engineer, is the *p*H scale, which at least gives a first indication of metals not to be used. Also the galvanic scale of metals should be

ever present in mind. Not only should the metals used be close together in this scale, but the area of the less noble metal should be large in comparison to a nobler metal used. Dissimilar metals should be insulated, if possible, or the less noble metal suitably coated. Aeration of the liquid should be prevented, or at least limited, and the hydraulic phenomena of cavitation entirely avoided.

Often a chemical inhibitor may help, such as chromates or alkalis, or replaceable pieces of bare zinc, or steel, may be fitted to counteract galvanic action. Less noble parts should be made easily replaceable and with a generous "corrosion allowance." It is also important that all metals should be of uniform and close grain, as often in the same basic metal dissimilar grain structure will form a galvanic series and so initiate violent corrosion.

All this will show that corrosion problems are not always solved best by simply using stainless steels for all parts instead of less corrosion-resisting metals. In many cases, for instance, a chromium steel casing (less noble) which is less costly, with Cr-Ni steel impellers, will give better service than using nickel-containing steels indiscriminately.

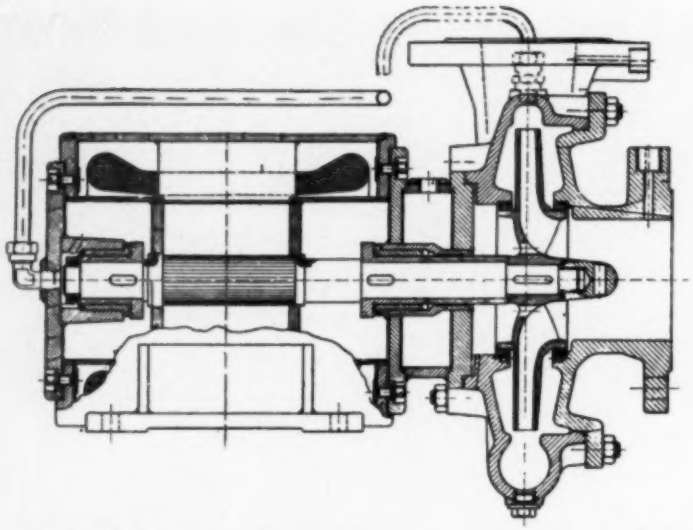
Minimum of leakage points

This refers to joints in the wetted casing, which ideally should be reduced to one and be simple and circular, to ease maintenance.

A sore point to the chemical engineer—and often an eyesore as well—is the method of sealing around the rotating or reciprocating shaft. Increasing attention is given to this point and many special designs of chemical pumps have been evolved to improve or eliminate this shaft seal.

Stuffing boxes

The "stuffing box"—the very name suggests primitivity—is still commonly used, though surprisingly undeveloped. It still consists of a space for the packing and a squeezing gland and basically has not changed since the beginning of pump engineering. Yet it is hard to believe that improvement should not be possible, and it is particularly desirable that a certain flexibility should be attained to enable the packing space to follow the inevitable shaft whip.



Typical section of a "canned" motor pump for chemical duties (Halberg GmbH.)

The very fact that a certain leakage has to be permitted to keep the packing in reasonable condition (by cooling and lubrication) has frustrated all efforts to improve it. The stuffing box is really unsuitable for a chemical pump, because many liquids handled in the chemical industry are either too dangerous, too corrosive, too toxic or too expensive to be allowed to be wasted.

Mechanical seals

From the oil industry has come the development of the mechanical seal, which today is almost universally used in that industry. It has now entered other fields, including the chemical industry, with conspicuous success. The chemical engineer, for good reasons, still harbours a good deal of scepticism about the mechanical seal. This is caused first by the great difficulty of finding the right materials for all its parts. Also they are awkward, when servicing is to be done, as complete dismantling is necessary to get at them. Lastly, they also require cooling and lubrication, which is either done by leakage (though smaller than with the stuffing box) or by external cooling and lubrication, which again may lead to contamination. Yet it must be admitted that vast improvements have been made possible by the introductions of mechanical seals.

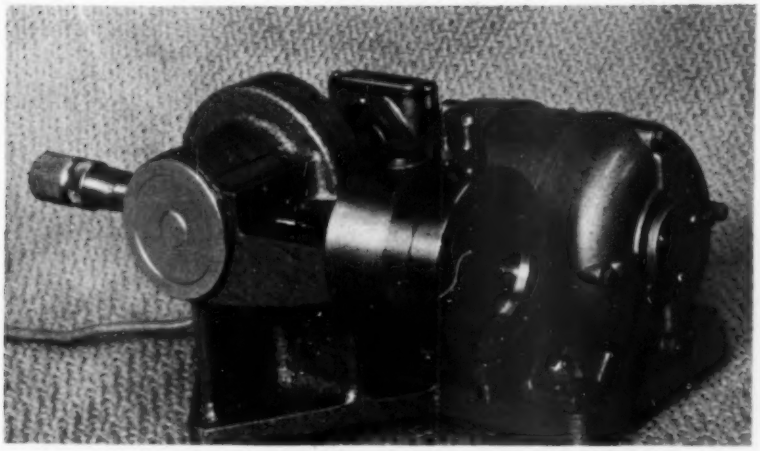
In the U.S.A. one maker claims to be able to provide mechanical seals for pressures up to 2,500 p.s.i. and temperatures up to 650°F.

Pseudo glandless pumps

Attempts to avoid both stuffing boxes and mechanical seals have resulted in so-called "glandless" pumps. These are either horizontal or vertical. They have no stuffing box or mechanical seals, but some other devices to improve leakage conditions.

The *horizontal* types are typified by the Rheinhuette RE and the *Wilfley* chemical pump. Here the essential feature is a ring valve around the shaft, which is kept closed, when the pump is stationary, by springs or weights acting on the shaft. When starting up, the valve is opened by movement of the shaft away from the seat, actuated by centrifugal force, and leakage is then prevented by appropriately dimensioned impeller back vanes or auxiliary impellers.

Such pumps have now been supplied in very large quantities over many years and must be accepted as a great step forward towards solving many leakage problems. As all things in life they have limitations. They should preferably be used with flooded suction, though suction lifts are possible. Suction pressures are limited by the back vane sizes possible, say up to 40 ft. according to shaft speed, but with an additional auxiliary impeller a further 25 to 30 ft. over this figure may be admitted. Back vanes and auxiliary impellers also consume power and thus reduce the overall efficiency. These pumps are, therefore, used mainly for low suction heads, but



In this metering pump of The Distillers Co. Ltd. the diaphragm is actuated by a plunger pump, stroke variable by micrometer screws.

fortunately this covers the majority of chemical applications.

Vertical pumps with return line are also often called " glandless," which is only partly correct, because these pumps still have a gland, though it need not be packed unless it is necessary to prevent air ingress and/or fume leakage. This is often the case in diluted sulphuric acid service, for which they are frequently used.

The liquid is prevented from rising to the gland portion by a return line. The Kestner and the Rheinhuette GVS are typical designs of this type. Whilst they certainly improve the gland leakage problem, it is not always convenient to install a vertical pump. Their use appears, however, to be on the increase.

From Sweden has come the hydrodynamic seal which appears to have found ready application in the Scandinavian industry where it is used in sulphate and sulphite mills of the paper industry and also in sulphuric acid plants and other chemical works (Phosphoric and nitric acids, sodium chloride and other brines). The hydrodynamic seal is a double-sided impeller working in a seal chamber on the pump suction end. One side of the impeller prevents the sealing liquid (usually the liquid being pumped) from entering the pump suction whilst the other side prevents the sealing liquid from escaping to the outside. A diaphragm valve acting against a shaft shoulder prevents leakage when the pump is stationary.

Pumps with this seal—called *Nobox* pumps—are always vertical. The sealing impellers must be designed for the suction condition applicable, but they are possible for 55 p.s.i. suction pressure or 24 in. Hg vacuum, which should be suitable for the majority of applications.

Genuine glandless pumps

The latest step has been towards the completely sealed chemical pump. This can be (*a*) powered by an electric motor inside the pump casing, with the rotor operating in the liquid, in which case it is called a " canned " motor pump because of the " cans " protecting the rotor and the stator; or (*b*) conventionally powered and driven by magnetic coupling or a magnetic field acting through a section of the hermetically sealed casing.

Both these types are now commercially available and in operation and, although their prices are understandably higher than those for pumps with orthodox drives, it can be taken for granted that such units will be used on an ever-increasing scale.

Submerged-motor pumps, for chemically neutral liquids such as water and oil, have been operated successfully for many years in borehole pumping and for circulation duties in boilers, transformers and heating systems. The " canned " motor pumps were developed from these " wet " motor pumps and in the nuclear industry in many cases no other pumps could be tolerated, as " zero leakage " is imperative in that industry. The pumping of radioactive substances has therefore provided a great impetus, but it is certain that the general chemical industry will in due course benefit.

Whilst it appears that such pumps, for the chemical industry, are at present being developed in Britain, no commercial unit has yet been offered. Sigmund Pumps Ltd. are currently advertising such a pump, the design of which is apparently based on their *Thermopak* heating circulator of which many thousands have been sold. Nuclear pumps of this type are, of course, available, but only in large sizes and for special duties. In the U.S.A., Germany and Switzerland, " canned " chemical pumps are commercially available and quite a few types were exhibited at the last Achema Exhibition at Frankfurt in May 1958. Thus a well-known Swiss maker has available a complete range of glandless chemical pumps which are also sold in this country (by Conveyor and Equipment Co. Ltd.). The pumps vary in design in accordance with the operating conditions, thus for 212°F. and 85 p.s.i. a standard pump can be used. For temperatures above 212°F. up to 260°F. and pressures of 140 p.s.i., a special pump with welded in rotor sleeve is used. Temperatures up to 750°F. and pressures up to 700 p.s.i. are possible with another type which has special cooling coils around the motor and a heat barrier space between pump and motor. These Swiss pumps are supplied in many acid-resisting materials and even self-priming glandless pumps are available or submerged glandless types. The standard range covers pumps up to 500 g.p.m. and total heads up to 180 ft., but units up to 100 h.p., as special designs, have been supplied.

The use of " canned " pumps in the chemical industry is still limited. Both manufacturers and users are proceeding with caution, but interest is widening and a few units are operating in the U.K. They are now beginning to enter the oil industry and it may well be that in a few years pumps with stuffing boxes and even mechanical seals will be regarded as old-fashioned.

There is no reason why " canned glandless pumps " should not be able to compete in price with other conventional pumps. Their present higher price is mainly due to smaller production runs. The most problematical components in canned pumps are the bearings, which are lubricated by the liquid pumped, but for very many liquids, suitable material combinations and designs are now available. In the U.S.A. the demands of the nuclear industry

have forced makers to design units of quite extraordinary size, pressures and temperatures. Pumps of this type are offered there for outputs from ¼ to 600 h.p. and for pressures up to 5,000 p.s.i., at temperatures to 700°F. In particular, pumps developed in the U.S.A. for liquid metals (sodium, lead, bismuth, etc.) are truly remarkable. Pumps of 40,000-gal./min. capacity for temperatures of 1,600°F. are available and some units supplied are for 3,400 gal./min., 700 h.p., at 1,500°F., and for 10,000 gal./min., 1,000 h.p. for liquid sodium, this latter pump having a total length of 29 ft.

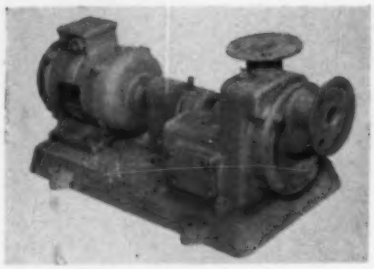
It would, indeed, be surprising if the experience gained with such pumps were not in due course utilised in the chemical industry, where the need for them has long been felt, though the necessity for using them might not be quite so pressing.

Magnetic-coupling pumps (mentioned above), which are also " zero leakage " types, will perhaps be used only for smaller outputs, as the design does not seem to permit economically the transmission of large magnetic forces. The limits are likely to be 10 h.p., though even this may be too high. They have, however, advantages over " canned " motor pumps, because they have a wider temperature range, from −195°C. to +500°C.—and also system pressures may be up to 850 p.s.i. Such figures would be difficult to achieve with " canned " motor pumps of simple design, though they can be made—at a price—as has been shown in the nuclear industry.

The nuclear industry has also been responsible for yet another type of " zero leakage " pump, namely the electromagnetic pumps, which make use of the magnetic properties of the liquids pumped (sodium, bismuth, mercury). A.c. and d.c. conduction pumps are available and efficiencies of 40% have been reached when boosting up to 400 gal./min. They have neither glands nor any moving parts.

Dealing with vapour and solids inclusions

Vaporising liquids. The ability of a pump to deal with vaporising liquids is a very important feature which has not, in the author's opinion, been given sufficient attention. Discharge branches and casings should always be arranged to prevent vapour pockets, which is not always the case with pumps now offered. Some " selfpriming " centrifugal chemical pumps are now offered and such units can certainly deal with vapours and often with solids. The " circulation " principle necessitates, however, complicated and bulky casings which, when made of special materials, are costly.



' Autostart ' pump by Girdlestone Pumps Ltd., with open impeller of special form.

Many applications do not in fact require self-priming, but only the capability of dealing with vapour inclusions. Typical cases are the pumping of mixtures, especially solid-liquid mixtures such as paper stuff, where vapour pockets always develop and may then result in choking the pump. Self-priming pumps could not be used for these applications.

Two new designs from Switzerland and Germany are claimed to deal with this aspect. They are the *Egger* pump and the *Eta-Jet* pump. Both use a contraction in the impeller, after which the shrouds widen out. This results in only partially filled impellers after a region of pronounced pressure reduction, thus providing space for vapour to be released and be pumped away. The *Egger* pump has the contraction at the blade inlet, whereas in the *Eta-Jet* the narrowest width of the impeller is at about half the impeller radius. These designs must be considered a distinct hydrodynamic advance and more will probably be heard of them in future.

Solids. All the pumps mentioned above will also deal with solids, provided the passages are large enough. In fact, the capacity of centrifugal pumps to deal with solids is quite astounding, provided the solids are small enough by themselves not to block the passages. Slurries, such as cement slurries, are successfully pumped with only 34% of water, or 66% solids content. Of course, the question of abrasion and corrosion remains. Manganese steel or solid rubber can deal with abrasion, but when corrosion also occurs both these materials have severe limitations. Manganese steel, unfortunately, is mostly ruled out due to the extreme difficulty of machining.

For abrasion only, solid soft rubber pumps give the longest life, but abrasion-resisting cast iron and special cast steels may also be expected to last an average of 1,000 to 1,500 operating hours even under severe abrasive conditions. Rubber linings are unsatisfactory because the lining will separate from the impeller periphery or the cut-water due to the high velocities at these places. Solid soft rubber pumps will also be restricted to fairly low heads, say maximum 100 ft., because the centrifugal forces plus abrasion at high flow velocities will damage the rubber at the blade exits.

For heads higher than 100 ft., only metallic materials of high abrasion resistance are really satisfactory and for cement slurries of high consistency (65% solids) special chromium steels are now available which will give a life of up to 6,000 operatting hours. If corrosion is also present, chromium-molybdenum steels must be used, which will also give a life of 5,000 to 6,000 operating hours under the above conditions. Many slurries such as cement, bauxite, milk of lime and china clay slurries are non-corrosive, though highly abrasive and, if they require pumping heads higher than 120 ft., can only be dealt with by metallic materials owing to the material stresses generated. Pumps for such conditions embody a great amount of ingenuity, not only as regards materials of construction, but also shaft sealing and flow pocket problems and only a few makers have successfully applied their resources to solving them.

Conclusion

Space does not permit coverage of the many other new types of chemical pumps, such as proportioning and metering pumps, hydraulically or pneumatically operated " zero leakage " pumps, bellows or diaphragm pumps, high-pressure reciprocating pumps and rotary pumps. Proportioning and metering pumps will increasingly be used for automatic processes.

This article is a revised version of one originally published in the Leonard Hill journal *Chemical and Process Engineering*, April, 1959.

Pumps for the Chemical Industry

Metering pumps

The use of metering pumps in one particular application is said to have resulted in increased production, simplified layout, and decreased plant supervision.

The plant installed was required to carry out a reaction involving the simultaneous addition of two major raw materials in a fixed ratio, over a period of about 5 hr. The two materials could not be mixed before they entered the reaction vessel.

On the experimental production unit this was achieved by breaking the additives down into separate distinct parts. Small measuring tanks, fitted between the storage tanks and the reaction vessel, were filled automatically by the use of float switches and magnetic valves. The total contents of the measuring vessels were then added to the reaction vessel *via* needle control valves. Thus at the end of each distinct addition the correct quantities of the raw materials had been added despite possible variations in rate during the addition.

This system, although used for about two years, was complex and the needle and magnetic valves and the float switches required considerable attention.

A larger plant was designed to replace the experimental set-up and ways were sought of improving the method of additions. On the new plant the measuring tanks, magnetic valves and float switches have been replaced by one duplex metering pump which gives a continuous feed of the two raw materials in a constant fixed ratio, although the overall rate of addition is infinitely variable. This system has now been running for several months and the metering pump has handled about 40,000 gal. of the raw materials without trouble.

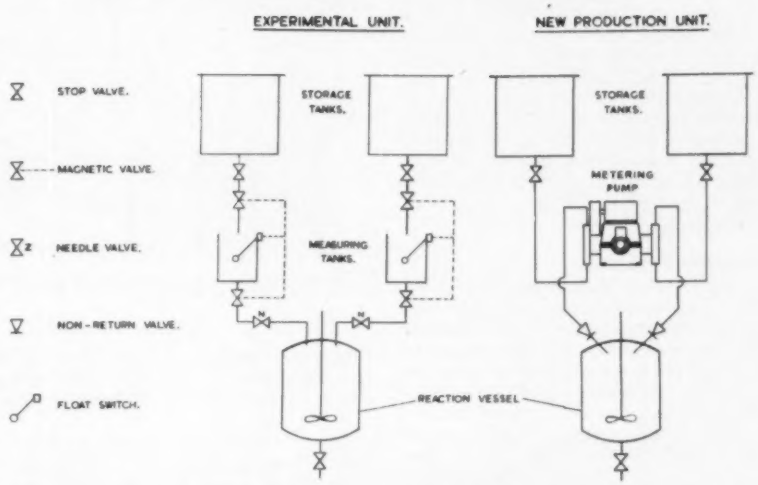
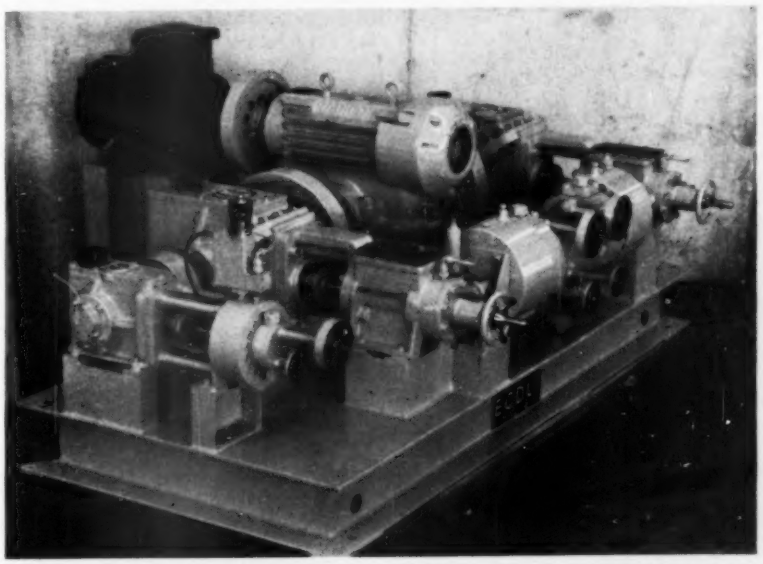


Diagram showing how a process was improved by the use of a metering pump in place of two measuring tanks.



Multi-pump piston-diaphragm unit consisting of one pump with a capacity of 5 g.p.h. and two 60 g.p.h. pumps.

Piston-diaphragm pumps

A multi-pump piston diaphragm unit, available from E.C.D. Ltd., consists of a small pump with a capacity of 5 g.p.h. against a pressure of up to 5,000 p.s.i.g. and two larger pumps each of 60 g.p.h. against a pressure of 2,500 p.s.i.g. The pumps are fluid-operated and the output of each is continuously variable from zero to maximum whilst running. When required each pump is fitted with pneumatic control for remote operation and automatic speed control to a variable speed gear fitted between the motor and worm reduction gear, enabling the total throughput of mixture to be automatically controlled by the processing plant.

The fluid ends of the pumps are of forged stainless steel with stainless steel diaphragms, but other metals, plastics or ceramics can be used to suit working conditions. Double suction and delivery valves of the ball, semi-ball or disc type are fitted as required for the fluid handled.

Advantages claimed for the pumps are that while they are of the positive displacement type the plunger and capacity control operate in the hydraulic fluid, which is usually oil but which may be di-octyl phthalate, silicone or glycerin in special applications.

The fluid ends in contact with the chemicals are glandless, the diaphragm being operated by displacement of the hydraulic fluid by the plunger. Diaphragms are plain discs of suitable material operating in a cavity formed by two concave plates which prevent overdeflection or overstressing of the diaphragm material.

A relief valve is built in on the hydraulic fluid side of each pump so that these are not subject to corrosive action of the fluid pumped.

Portable p.v.c. pump

A portable pump, manufactured throughout of rigid p.v.c., and designed for use with corrosive liquids, operates on the Archimedean principle. In

operation a number of impellers rotate on a shaft within the main body, and discharge is through a flexible p.v.c. box.

The pump is powered by a totally enclosed ¼ h.p. motor. It is available in 50, 110 and 230 V. ratings and incorporates a lifting handle and contact switch. Glands between the pump unit and the motor shaft are in carbon-faced *Hypalon* and there is a secondary gland packing in p.t.f.e. The pump is stated to have a maximum delivery of over 600 g.p.h. at no lift, and is available with immersion depths of either 2 or 3 ft. Total weight is 16 lb.

Glandless pumps

The simpulsic variable capacity glandless pump is available for pumping corrosive, viscous, or other liquids that are difficult to handle. Liquid is conveyed through components made in natural or synthetic rubber, without contacting metal parts.

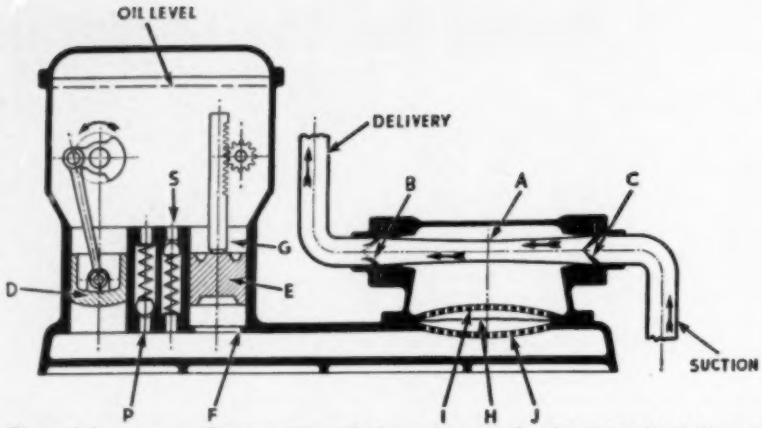
One standard model is made, suitable for a maximum discharge range of from 0 to 11 g.p.m., and a minimum discharge range of 0 to 1 g.p.m. Self priming up to 12 ft. suction lifts, the pump is said to be capable of delivery heads up to 60 ft. water. It is driven by means of a ½ or ¾ h.p. geared motor through an oil bath chain drive, all mounted on a combined baseplate with the pump.

Another glandless pump, a self-priming tube diaphragm model, is said to be capable of working against discharge pressures up to 100 p.s.i. and of dealing with capacities up to 6 g.p.m. Capacity of the pump may be varied whilst it is running. It is available in contact materials suitable for most corrosive chemicals.

A new series of Kestner axial flow pumps is primarily intended for handling corrosive fluids. Of the helical propeller type, no gland is employed and the vertical shaft is sealed by one of the following methods:

1. The pumped liquor is allowed to enter the sealing chamber above the shaft labyrinth sleeve through an inlet passage having an entry lip facing the flow of incoming liquor. After circulating around the shaft the liquor is extracted and returned to the main flow by the venturi effect of an outlet channel facing the suction side of the impeller, the shaft labyrinth effectually preventing air entrainment. The sealing chamber is normally vented and the drain branch is blanked off as it is not required.
2. The second sealing method omits the recirculation channels, a separate supply of sealing liquor being fed to the chamber and labyrinth, drainage being through the branch which is blanked off for the first arrangement.

The impeller is a four-bladed helical design, both sides being shrouded and carrying guide vanes to improve the flow pattern.



Simpulsic pump. Contraction of the tube expels the contained liquid through valve B, the following suction impulse expands the tube, closing valve B and filling the tube with liquid through valve C.

In the *HPS*80 unit the body casings are in Regulus metal, the impeller and guide vanes are in Tantiron, while the mild steel shaft is protected by a combination of a homogeneous coating of regulus metal and tantiron sleeves. The shaft is carried in self-aligning double ball and roller bearings, a separate ball thrust bearing catering for axial loads. Steaming-out points are provided on the pump body to facilitate dismantling when crystallising liquors are being handled.

The *HPS*80 has a basic nominal capacity of 800 m³/hr. One other unit at present available is the *HFNi*100, this unit having a nominal capacity of 1,000 m³/hr. and is of nickel/cast iron construction.

Further smaller sizes are envisaged for future development and consideration can be given to all the usual corrosion resistant alloys for use as contact materials.

A pump for pastes

The Meader pump has been developed for handling heavy pastes, slurries and similar materials in the chemical and allied fields. Its principle of operation is claimed to be unique in that the inlet to the pump is the effective area of its cylinder, thus enabling the materials mentioned to enter the pump, which with normal types of valved pumps is not possible. Once in the cylinder, the material is forced out under pressure by a normal piston.

Basically the pump consists of an hydraulically operated power end and a mud end. The mud end consists of a hopper, a cutting cylinder and a piston. The cutting cylinder advances and retracts into the material in the hopper, and whilst in its forward position the open end of the cutting cylinder is sealed and a ram forces the material through the outlet.

The hydraulic end of the pump consists of two pistons in a cylinder, one connected to the cutting cylinder and the other to the mud ram. The pump is governed by automatic hydraulic control gear mounted on a common baseplate with the pump units. It is necessary to supply a centrifugal or similar pumping unit to provide the hydraulic power.

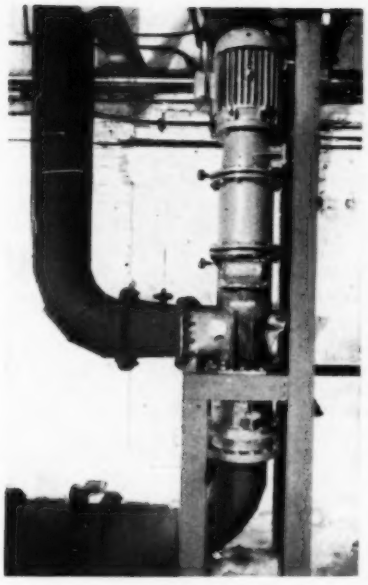
The pumps are made in capacities of up to 20 cu. yd. per hr. Power consumption varies from 3 h.p. in the case of the smallest unit, up to 65 or more h.p. in the case of the larger units, depending upon the resistance of the material and the distance over which it has to be handled. The pumps are available in corrosion resistant materials.

Glandless chemical pump of the canned motor type

Self-priming pumps

The *Autostart* self-priming centrifugal pump from Girdlestone Pumps Ltd. is said to be suitable for handling solvents, acids and other corrosive liquids. Uses include transfer duties from underground tanks, distillate extraction, process work and the emptying of carboys, drums and sumps.

A feature of the pump is that there are no internal check valves or fine working



Kestner HPS 80 pump unit.

clearances and the pump body, priming chamber and bearing housing are cast in one piece, reducing the number of liquid joints to a minimum and ensuring maximum strength and rigidity. The cantilever shaft rotates in two externally housed deep-groove ball bearings and the impeller is of the open type capable of passing small solids in suspension. An adjustment at the driving end is provided for impeller positioning and for taking up wear on the impeller face. Mechanical shaft seals are fitted. Standard materials of construction are 18/8/3 stainless steel or cast iron, but pumps can be constructed of other resistant materials. The pump is said to be capable of drawing a high vacuum, and of delivering against heads up to 60 ft. at 2,850 r.p.m. and up to 90 ft. at 3,440 r.p.m.

The company also manufactures a self-priming glandless diaphragm pump. Rubber lined throughout, it is stated to be suitable for corrosive liquids, whilst cast iron and gunmetal pumps are available for handling chemical slurries and other abrasive liquids. An advantage of the pump is easy maintenance; the rubber valves and diaphragms can be changed without disturbing pipe connections.

Canned motor pumps

As a result of a recent agreement with the Chempump Corp. of Philadelphia, U.S.A., L. A. Mitchell Ltd. now offer a range of glandless *Chempumps*. They are a "canned motor" pump in which the impeller is joined directly to the motor rotor by a short shaft extending from the rotor chamber to the pump chamber. Pumped fluid is allowed to circulate in the rotor chamber, cooling the rotor, stator and bearings and also providing automatic lubrication for the bearings. Stator windings are isolated from pumped fluid by a non-magnetic corrosion resistant liner and the rotor itself is protected by a similar corrosion resistant can. All parts of the combined motor and pump coming into contact with the pumped fluid are of corrosion resistant materials.

The pumps are glandless, and it is stated that no mechanical seals or shaft sealing devices are required. They are available in a wide range of sizes and materials of construction include cast iron, steel, stainless steel, monel metal and, in the case of certain sizes, titanium and P.V.C. pump casings. Sizes range from fractional horsepowers to 15 h.p. at capacities of up to 250 g.p.m. and heads of up to 120 ft. Larger models are in process of design.

The pumps are said to be suitable for handling corrosive liquors, volatile fluids, such as hydrocarbons and solvents, *etc.* and particularly radio active liquors and effluents. Special models are available for high temperature pumping applications up to 1000°F. including the pumping of liquid heat fluids. L. A. Mitchell Ltd. say that the pumps require virtually no maintenance once correctly installed.

Industry's Publications

Rigidex polythene. An illustrated booklet from British Resin Products Ltd. describes characteristics, applications and forming processes for *Rigidex* high density polythene.

New chemical directory. The 1959 edition of "British Chemicals and their Manufacturers" has been published by the Association of British Chemical Manufacturers. It is larger than previous editions and contains over 12,000 products named systematically and in accordance with British Standard 2474: 1954—"Recommended Names for Chemicals Used in Industry." The Directory is unique in the chemical field in that only actual manufacturers of the products are named against each entry. Copies are available to all persons or firms genuinely interested in the manufacture or purchase of chemicals. All enquiries should be addressed to the Association at 86 Strand, London, W.C.2.

Ion Exchange Resins. The fourth edition of this B.D.H. booklet contains full details of all resins in the *Amberlite* and *Permutit* ranges, including the analytical and chromatographic grade resins. Tables give details of the physical properties of the various types. The section on applications has been revised and extended and now includes details of some of the newer advances in resin technology, *e.g.* preparation of "selective" resins, ion-exchange chromatography, ion exclusion, applications of ion-exchange membranes. The booklet concludes with a table listing the potential and recommended applications of the various resins, a bibliography of books and review papers for further reading, and a subject index. It is available from the British Drug Houses Ltd.

Language of work study. A new British Standard, B.S. 3138, provides the basis for a common language among those concerned with the application of work study. The standard contains 38 pp. and is divided into three parts, the first defining the general terms "work study," "method study" and "work measurement," the second defining terms recommended for use in method study, while the third part contains a large number of terms and definitions relating to work measurement.

Copies of the standard, price 7s. 6d., may be obtained from 2 Park Street, London, W.1.

Fatty acids and alcohols. Technical Publication No. 5, *Fatty Acids and Fatty Alcohols in Soaps, Toiletries and Cosmetics*, available from Price's (Bromborough) Ltd., describes the functions of fatty acids and fatty alcohols in the manufacture of soaps, toiletries and cosmetic products. General principles and practical methods are discussed, and the use of these raw materials is illustrated by a number of formulations.

Laboratory machinery is the title of a 20 pp. illustrated publication from the Sturtevant Engineering Co. Ltd. It describes their crushing and grinding plant, screening and separating equipment, mixers and samplers for laboratory use, and supersedes Publication No. 9605a.

The company's *Publication* 2504 gives data on their type MVAZ multivane fans.

Exporting to the Middle East. The Advisory Council on Middle East Trade has published a booklet entitled "Exporting to the Middle East" describing the opportunities which exist for the expansion of British trade with the Middle East, following the rapid increase in Middle East oil revenues over the last few years.

The booklet, which is issued free of charge, is being distributed widely to manufacturers, trade associations, etc., and aims to emphasise the importance of the Middle East market, the past achievements of British industry there and the opportunities which now exist.

It is hoped that the information will help to stimulate a greater interest in the area generally and make an increasing number of manufacturers and traders alive to the opportunities for expanding British exports to that part of the world.

Copies of the booklet may be obtained from the Board of Trade, Directories and Notices Section, Room 0348, Horse Guards Avenue, London, S.W.1. (Telephone Trafalgar 8855, ext. 2928.)

Perfumes for Cosmetics

6. SUN-TAN PREPARATIONS

By V. Vasic, CH.E.

*Sun-tan preparations are intended to be used profusely over large areas of the skin. Also they are used by both sexes. Accordingly their perfume should not be overpowering, but it should be sufficiently strong to overcome the odour of a freely perspiring skin. At the same time it must be acceptable to both men and women. From this standpoint Mr. Vasic discusses the selection and formulation of suitable perfumes. He also considers photosensitisation.**

SUN-TAN preparations are generally used at one time in a large quantity over a considerable surface of the body so that the perfume is very noticeable. The odour of human perspiration is usually intensified in a blazing summer sun, so the perfume of a sun-tan preparation should be sufficiently strong to be pleasant despite this conflicting odour.

Sunburn and sun-tan cosmetics may be grouped into three:

1. Sun-screen preparations designed to allow tanning with the minimum of sunburn; the most important group.
2. Simulative preparations designed to produce a brown skin in the minimum of time and with the least possible pain or trouble; essentially preparations which stain the skin brown.
3. Palliative preparations designed to alleviate the pain and irritation resulting from excessive exposure to sunlight.

Sun-screen and simulative preparations can be of two types: greasy and non-greasy, and may be oils, lotions, creams or powders. Greasy types are criticised on the ground that they pick up sand and grit and are messy in use. However, the fatty base in such preparations may play an important part in skin protection. They are not washed off in swimming, so that those who prefer a lasting "screen" may choose a preparation of the greasy or of the water-in-oil type.

Simulative preparations are usually based on oil-soluble dyestuffs. Heavily pigmented face powders, or modifications of the "cosmetic stockings," may also be used.

Palliative preparations may be formulated on the basis of calamine lotion or other zinc preparations, or upon tannic acid. They should be antiseptic.

Type of perfume

In the selection of perfume for sun-tan preparations a factor of first importance is that these preparations are intended for use by both sexes. A feminine, heavy floral, typically ladies' perfume will not appeal to men. The scent must be sexually neutral or have a dual appeal. Rose, lily-of-the-valley, rose-lavender and rose-neroli notes are appreciated by both sexes. Lilac and violet are appreciated by women and accepted by men, and lavender, fern and cologne are appreciated by men and accepted by women. Due to the rather profuse application of sun-tan products strong and tiring perfumes should be avoided. A comparatively light floral bouquet with a lavender suggestion or a very light shade of lilac, rose and honeysuckle with a modern top note would be most suitable. Certain perfume compounds, such as those of the clover group, are unsuitable because they tend to accentuate the odour of the sun-screen if this does possess an odour. Heavy perfumes should be avoided as the odour can be overpowering.

Photosensitisation

The absorption of certain pigments and drugs and external contact with certain plants (bergamot, lime, wild parsley, angelica, etc.) may render the human skin photosensitive, *i.e.* on subsequent exposure to sunlight eruptions occur which differ from those normally produced by sunlight. These eruptions do not occur on exposure to sunlight or ultra-violet light in the absence of a sensitising agent. One of the earliest papers by Freund deals with the so-called Berloque dermatitis. Berloque dermatitis is the name of an irregular discoloration of the skin which appears occasionally upon exposure to the sun of skin previously sprayed with eau-de-cologne. At first, bergamot oil alone was held responsible for this phenomenon. However, Berloque dermatitis and the concomitant skin pigmentation are not the sequel of a simple sensitisation, but rather the result of a combination of factors in which irradiation by sunlight plays an essential rôle. This condition has been observed and reported upon by several investigators.

Rogin and Sheard suggested that chlorophyll or some adulterant may be responsible, but this is not in agreement with the findings of Gireaudeau and Acquaviva who definitely exclude chlorophyll, and linalyl acetate too, as causative agents, although they did demonstrate that bergamot oil sensitises to visible light within the range of 3,900 to 6,000 Ångstrom units, *i.e.* from the violet to the yellow part of the solar spectrum.

According to Goodman, traces of copper in the oil, originating from the copper containers in which oil of bergamot is shipped, is necessary for the sensitisation reaction to take place, but this is difficult to justify. Recent experiments by Lerner, Denton and Fitzpatrick indicate that the psoralens present in a variety of natural oils (including the oils of bergamot and of other citrus fruits) are responsible for the hyperpigmentation of Berloque dermatitis. It has been known for some time that local application of 8-metho-xypsoralen to normal skin, followed by exposure to sunlight, causes erythema

* Previous articles in this series were:

1. Face Powders, July 1958.
2. Face Creams, August 1958.
3. Lipsticks, October 1958.
4. Deodorants and Antiperspirants, June 1959.
5. Bath Preparations, September 1959.

and hyperpigmentation. A new effect observed by Lerner indicates that oral intake of 8-metho-xypsoralen followed by exposure to sunlight increases the ability to tan. This is assumed to represent an actual potentiation of tanning capacity.

Oil of bergamot does not stand alone as a factor in photosensitisation. Other essential oils, both of the citrus type as well as those in other categories, have been recognised as photosensitisers. Among them is oil of lime, which causes pigmentation upon exposure to sunlight. Oil of neroli and oil of petitgrain are photosensitisers. Oil of cedarwood produces a photosensitisation type of dermatitis, sometimes associated with pigmentation. Oil of lavender has been identified as the cause of sensitisation dermatitis, and pigmentation of the skin following topical application has been reported. Other essential oils suspected of sensitising capacity are the oils of angelica, anise, bay, bitter almond, cade, calamus, carrot seed, cassia, eucalyptus, linaloe, orange, rosemary and ylang-ylang.

According to R. G. Harry, the sensitiser itself is inert, and it is absorption of light of certain wave-lengths by the sensitiser that produces the photo-chemical reaction. Only the wave-lengths absorbed are effective in producing a chemical change (Draper's Law), hence a determination of the absorption spectra of the suspected photo-sensitising substance and the exposure of the individual after contact with this suspected substance to filtered light of the requisite wave-length will provide evidence of the truth of the supposition.

Blum classified certain substances as photo-dynamic. These substances all fluoresce in ultra-violet light. They exhibit a latent period prior to the photo-chemical reaction and cause organisms and tissues to exhibit abnormal reactivity to light. He described photodynamic action as the sensitisation of a biological system to light by a substance which serves as a light absorber for photo-chemical reactions in which molecular oxygen takes part.

Klaber suggested that the term phyto-photo-dermatitis should be adopted as a generic title to cover every variant of those eruptions produced by external contact with plants and their extracts after subsequent exposure to light. The cases described as phyto-photo-dermatitis may not be examples of photo-dynamic action, and to settle this question it would be necessary to see whether the pure substance exhibited the properties of fluorescence.

R. G. Harry stated that it should be noted that true photo-sensitivity (including phyto-photo-dermatitis) differs from allergy or idiosyncrasy in that, although some variations in individual sensitiveness occur, the eruptions are encountered in the majority of persons if the necessary conditions governing photo-sensitivity (*i.e.* contact penetration, and exposure to light of the required wave-length) are fulfilled.

Formulary

Perfume A.P.6 for Water-alcohol Sun-tan Lotion

Floralys 42, Givaudan	25
Linalyl acetate	10
Phenylethyl alcohol	10
Neroli 27, Givaudan	5
Linalool	3
Ambre 1600, Givaudan	2
Diethylene glycol monoethyl ether, rectified	45
	100

Perfume A.P.5 for Sun-tan Cream

Amarante creme, Givaudan	30
Linalyl acetate	20
Phenylethyl alcohol	16
Citronellol	10
Raldeine Delta, Givaudan	10
Linalool	5
Vetyvenol	5
Aldehyde C.12, MNA, 10%	3
Versalide	1
	100

Perfume A.P.7 for Sun-tan Aerosol

Base A.R., Givaudan	30
Linalyl acetate	20
Terpineol, extra	10
Cetonia 34, Givaudan	10
Lavender oil	10
Phenylethyl alcohol	9
Linalool	5
Neroli 27, Givaudan	5
Versalide	1
	100

Perfume for Sun-tan Cream

Bergamot oil, terpeneless	60
Neroli, synthetic	20
Thyme oil	8
Rosemary oil, terpeneless	4
Lemon oil, terpeneless	4
Jasmin, synthetic	4
	100

Perfume compounding

Stable perfume compositions with a basic rose note can be built up on rose alcohols, such as geraniol, nerol, citronellol, phenylethyl alcohol and tetrahydrogeraniol. Small additions of rectified geranium oil and palmarosa oil, and also genuine rose oil, will improve the rose note. The rose note blends very well with the violet note of ionones, especially with methyl ionone, and a very attractive composition can be compounded based on this combination. Guaicwood oil is a useful blend and fixative for the rose and violet perfumes, enhancing the sweetness of many compositions. Styrax absolute is also an excellent fixative.

The combination of rose note and jasmin note is also very attractive. Jasmin note is based on α-amyl cinnamic aldehyde suitably rounded off. In the jasmin base intended for sun-tan creams indole should not be used. Addition of methyl ionone produces very interesting effects in the rose-jasmin combinations. Cyclogeranyl acetate and cyclamen aldehyde give freshness and lightness to the composition.

The third very suitable note for sun-tan perfumes is a complex of lavender and rose, modified with methyl ionone. On the basis of this note further perfumes with modern notes such as fougère and chypre can be developed.

Concentration of perfume

The concentration of perfume in sun-tan preparations should be just sufficient to mask the odour of the base and the sun-screen and impart a pleasant scent to the finished product. It is difficult to generalise about the concentration of perfume for all sun-tan preparations in view of the range of odours one is likely to encounter with different screening agents and the vehicle. However, the usual content ranges from 0·1 to 0·5 per cent.

Perfume stability

Ingredients employed in sun-tan preparations, such as carriers, solvents and sun-screen agents, are generally not reactive in the presence of perfume materials. The main problem involves photolysis, because sun-tan preparations are exposed to the direct and strong sunlight. Perfume materials usually used in

the compounding of the perfumes for sun-tan preparations stand up rather well in sunlight.

Discoloration

Sun-tan preparations are very often tinted, usually to a light brown colour. In compounding a perfume for these preparations the use of ingredients which cause discoloration, such as methyl anthranilate and vanillin, is not necessarily to be avoided. But the use of ingredients known to cause discoloration should be avoided in perfumes intended for white sun-tan creams or other white or pale tinted preparations.

Incorporation of perfume

Sun-tan preparations may be of such varied types as oils, lotions, creams and jellies, prepared by different methods and which may or may not be greaseless. It is difficult, therefore, to recommend the best method or time for incorporation of the perfume for all types.

Oil-soluble perfumes should be used in sun-tan oils. They are usually prepared by simple mixing of oil-soluble sun-screen, anti-oxidant and perfume with an oily base, followed by filtration. No heat is used.

In water-alcohol sun-tan lotions solubility problems may be encountered if a large proportion of water is present. It has been suggested that the perfumes be mixed with the alcohol and alcohol-soluble materials, stirred until there is a clear solution and water added. The problem can be also overcome by incorporating perfume solubiliser.

In emulsified lotions the perfume is usually soluble in the emulsified material. The oil-soluble materials, without the perfume, are heated to 80°C., water heated to same temperature is stirred in and the emulsion allowed to cool. Perfume is incorporated when the temperature has dropped to about 45°C.

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Cosmopoetics

By John Brooks

Delightful girl!
Of lovely limb and lorn, sweet smile—
How to show you to yourself through lover's eyes? A while
But listen to your partner's plea—
On just this one occasion, please, to me . . .

Though of fairness so serene,
You took, it seems, a magazine,
With tints of rose and glossy prose
And Beauty was its theme.

Alas, my love! though thou art fair
Thy heart's as brittle as thy hair;
Art thou so changed, my Helen, since
Thy crowning glory got that rinse?

The highlights flame,—like whatsername,
The girl in the film about Big Game.
You're svelte, you're sleek, you're smooth as ice;
That silver streak? Perhaps it's nice.

The muddy vesture that, lambkin,
At night doth grossly close you in—
Smitten kitten, tell me true,
Does night starvation bother you?

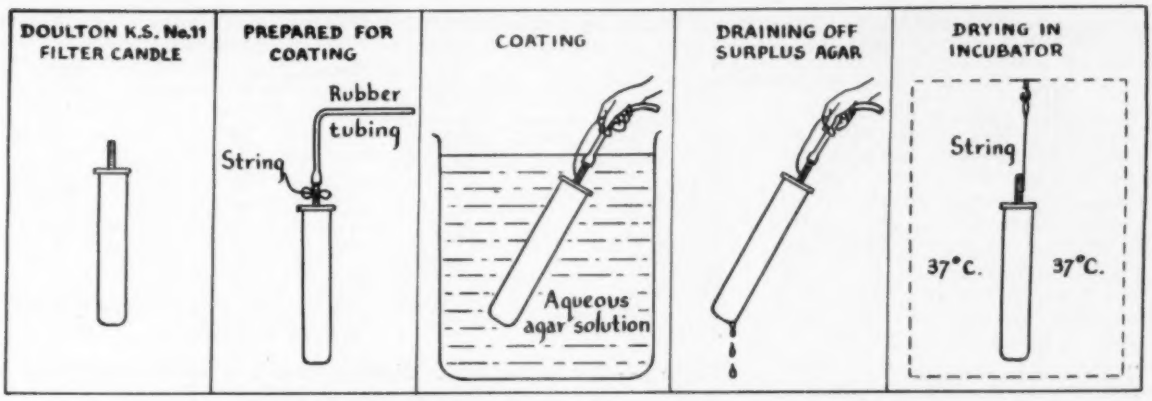
Your cream foundation's soft as mink,
It closes up the pores, I think;
Your skin-food, too; it's good to feel
Your skin enjoys a hearty meal.

A secret pigment overall
Holds your damask cheek in thrall;
Your wind-spun powder's made by process
Fatal to refulgent noses.

Your lipstick conjures tropic oceans,
Cereal skirts and savage notions;
A new, exciting Jungle Shade;
Hibiscus? Yes, or raspberryade.

Your eyes are blue, their lids are too,
Tahitian Night exhales from you;
Would I not love thee, dear, so well
Were I insensitive to smell?

Girl, who in pristine beauty moved
Through meadows where we met and loved,—
Tell your beseeching, hapless swain
When he shall see *thee* again?



Steps in the preparation of an ultrafilter by coating a filter candle with agar

Agar Films as Ultrafilters

By G. A. Flint and O. C. Forbes*

Ultrafilters for the concentration of toxins, toxoids, serum globulins and the intrinsic factor of stomach were prepared by coating Doulton candles with agar solution. The method is simple, cheap and reliable and readily adaptable to large-scale processes. The authors describe the preparation of the filters, techniques and applications, and their advantages over other ultrafilters.

METHODS

Preparations of films

DAVIS's agar was used. It was dissolved in hot tap water at strengths of (W/V) 2·5, 1·0 and 0·5%. Doulton candles (grade K/S No. 11) were then coated with these solutions by submerging them in hot agar at a temperature just below boiling point, care being taken to exclude liquid from the inside. They were removed after 5 sec., then hung up to dry by means of twine tied to the metal nozzle. The manner of handling thereafter was such that no part of the coated candle came into contact with an extraneous object. Films were dried at 35°C. in still air for varying lengths of time. When dry, each candle was assembled in its stainless steel container, the latter then being filled with the liquid to be filtered, enough to cover the candle. Suction was applied, the ultrafiltrate being collected in an empty bottle interposed between the vacuum pump and the candle. The pressure used, unless otherwise stated, was 15 lb. vacuum p.s.i.

* From the Evans Biological Institute, Runcorn, Cheshire. Dr. Forbes's present address is the Department of Medical Biochemistry and Pharmacology, The Medical School, Birmingham, 15.

Chemical tests

Changes in concentration of intrinsic factor and horse serum globulin in solution were followed by determination of the total solids before and after filtration. Tests for the agar content of solutions were carried out by treating 10 ml. of the boiling solution with 0·5 ml. of 0·1 N iodine and cooling rapidly. The development of a purple colour was evidence of the presence of agar in solution. Pilot experiments in which known quantities of agar were added showed that this test could be employed to detect as little as 0·005% in water and 0·01% in diphtheria toxin or toxoid. The test was based on a description given in Thorpe's "Dictionary of Applied Chemistry," 4th edition.

Biological tests

Changes in concentration of toxins and toxoids were determined by flocculation with standard antisera. The potency of tetanus toxin was determined as the L+/10 dose in mice, in addition to the use of flocculation methods. The unit of antigen to which most frequent reference will subsequently be made is the flocculating equivalent (Lf). These tests are described in the British Pharmacopœia, 1958.

RESULTS

Diphtheria toxoid

The first series of experiments utilised diphtheria formol toxoid and the results (Table I) indicated that some degree of concentration was achieved with each of the films used. However, in these experiments there seemed to be some loss or destruction of antigen amounting to as much as 33% of the total quantity filtered in one instance (Table I). Here was evidence, none the less, that the films were reasonably stable and could be used for over 12 hr. without appreciable disintegration. Further evidence of the integrity of the films was provided by the fact that the rate of filtration remained practically the the same at constant pressure for upwards of 12 hr.

By means of a simple calculation, the results shown in Table I were used to compare the efficiency of the different films. An index of efficiency (I.E.) was defined as the volume of unfiltered toxoid cleared of antigen by the ultrafilter in one hour.

$$\text{I.E.} = \frac{L-l}{L} \times R,$$

where: L = Lf of unfiltered toxoid (Units/ml).
l = Lf of filtrate (Units/ml).
R = Rate of filtration (ml/hour).

Table 1.—Concentration of diphtheria toxoid by ultrafiltration through agar at 16°C.

Initial Lf of toxoid filtered = 77

Strength of agar solution used to prepare film (%)	Duration of drying of film (hrs.)	Volume of filtrate (ml.)	Volume of residue (ml.)	Lf of filtrate	Lf of residue	Rate of filtration (ml/hr.)	Percentage loss of active material
2·5	12	300	200	34	99	25	21·0
	18	300	200	32	99	25	23·0
1·0	6	500	200	25	250	140	2·0
	12	1050	200	25	342	110	1·0
	18	500	200	30	133	90	22·0
0·5	6	500	500	50	88	200	9·8
	12	750	250	15	175	170	28·0
	18	500	200	20	175	110	33·0

Taking, for example, the values shown in the first row of Table I:—

$$\text{I.E.} = \frac{43 \times 25}{77} = 13{\cdot}9$$

The values given in Table 2 indicate that films prepared from as little as 0·5% agar provided efficient ultrafilters. There seemed to be some disadvantage in using films prepared from 2·5% solutions, but this possibility has yet to be confirmed.

The loss of active material shown in Table I was then investigated and was found to be due to the adherence of antigen to the surface of the film. By gentle agitation of the residue in the candle for 5 min., nearly all of this activity could be recovered. This fact is illustrated by the values given in Table 3. Furthermore, by using new candles free from irregularities on the surface it has been possible to obtain filtrates free of antigenic activity, thus indicating that agar can provide a perfect ultrafilter.

Table 2.—Efficiency of agar films as ultrafilters

Strength of agar solution used to prepare film (%)	Duration of drying of film (hrs.)	Index of efficiency* (See text) (ml/hr.)
2·5	12	14
	18	15
1·0	6	97
	12	73
	18	54
0·5	6	70
	12	137
	18	81

* *The greater the numerical value of the index the greater the efficiency.*

Table 3.—Concentration of diphtheria toxoid by ultrafiltration through agar at 16°C.

Initial Lf of toxoid = 72. Films were prepared from 1·0% agar in water, dried 12 hrs. at 35°C. Time taken for filtration was measured from the time of first appearance of ultrafiltrate.

Expt. No.	Total Lf filtered	Total Lf in residue	Vol. of filtrate (ml.)	Lf of filtrate	Vol. of residue (ml.)	Lf of residue (units/ml.)	Lf lost	No. of times concentrated	Time for filtration
1	86,400	86,100	900	No flocc.	300	287	300	4	9 hrs.
2	86,400	86,400	840	No flocc.	360	240	None	3	8½ hrs.
3	86,400	85,760	880	No flocc.	320	268	640	4	8½ hrs.
4	86,400	85,880	820	No flocc.	380	226	520	3	8½ hrs.

Table 4.—Two experiments each of 3 days duration, showing stability and efficiency of agar films as ultrafilters

Temperature = 16°C. (± 1°). Initial Lf of toxin filtered = 43.5.
For comparable pressures in each experiment see text.

Strength of agar solution used (%)	Duration of drying	Vol. of filtrate (ml.)	Vol. of residue (ml.)	Lf of filtrate	Lf of residue (units/ml.)	Mean rate of filtration (ml./hr.)	Percentage loss of active material
1·0	12 hr.	2,620	Top fraction = 365 Bottom fraction = 280	No flocc.	Top = 53·5 Bottom = 364	36·4	0·7
0·5	12 hr.	4,420	Top fraction = 500 Bottom fraction = 240	No flocc.	Top = 87 Bottom = 750	60·4	0·4

Table 5.—Concentration of tetanus toxin by ultrafiltration

Temperature of filtration 18°C. (± 1°C.).
$L^+/10$ dose was determined in mice (wt. 19 gm.).
Agar films were dried 35°C. for 12 hrs.

Toxin No.	Strength of agar used (%)	Initial Lf	Initial $L^+/10$ dose (ml.)	Lf of filtrate	Lf of residue	$L^+/10$ of filtrate (ml.)	$L^+/10$ of residue (ml.)	Vol. filtered (ml.)
1	2·0	8	0·016	Not known	Not known	0·028	0·0096	28,000
2	0·5	5	0·025	No flocc.	16	0·050	0·005	34,000
3	0·5	8	0·0175	No flocc.	20	0·050	0·010	27,000

Diphtheria toxin

A sample of diphtheria toxin was used in two experiments designed to test the duration of time for which agar films could be relied upon to act as ultrafilters. The appearance of active material in the ultrafiltrate would provide evidence of disintegration of the film. So would the presence of agar in either residue or ultrafiltrate. Repeated tests revealed no agar in either residue or filtrate, thus indicating that the agar content of these liquids was less than 0·01% which is the lower limit of sensitivity of the test for agar. It cannot yet be stated with certainty whether or not minute traces of agar are present in either ultrafiltrate or residue.

In these experiments the level of liquid in the stainless steel container was kept constant by means of a syphon. Under these circumstances the residual liquid surrounding the candle at the end of the experiment was found not to be homogeneous and was, therefore, syphoned off in two portions: a top fraction consisting of less concentrated antigen and a lower fraction of greater concentration. This bottom layer was further concentrated by using it to wash the surface of the candle. The values given in Table 4 for the bottom layer refer to this final concentration. The degree of suction applied to the filter varied over

a wide range in these experiments. The procedure was the same in each experiment, however. Vacuum was applied at 30 lb. p.s.i. and the filter sealed off from the pump by a screw clip. Filtration then proceeded slowly in this closed system until the pressure dropped to 20 lb., when the system was again evacuated to 30 lb. This range (20-30 lb.) was maintained throughout the working day. At night the pump was not used and the pressure next morning was found to have dropped from 30 to 10 lb. Filtration continued throughout the night and was always seen to be proceeding at a slow rate in the morning, when the daytime routine was re-introduced. Despite these wide fluctuations in suction the film remained intact, no active material having escaped in the ultrafiltrate over a period of three days. (See Table 4.)

Tetanus toxin

Three samples of this toxin were successfully concentrated by ultrafiltration through agar. The results are shown in Table 5. Toxins of low toxicity were readily concentrated and converted into highly toxic material by the method.

Intrinsic factor of stomach

The need arose, during the processing of this material, to concentrate on aqueous solution without application of heat or chemical agents. This was successfully achieved, as the following values indicate. A 0·5% agar coated candle was used. Concentration was estimated by following the increase of total solid content, since biological assay of the active principle required the use of suitable patients and these were not readily available.

	gm. %
Concentration of initial solution	= 3·2
,, ,, filtrate	= 1·1
,, ,, residue	= 6·5

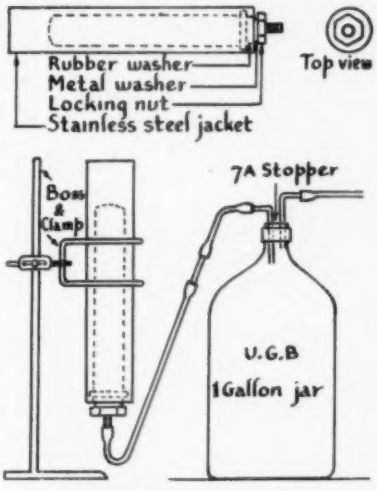
Qualitative tests for protein, using salicylsulphonic acid precipitation and comparing the turbidities of the test solutions, indicated that the increase in solid content on filtration corresponded with a significant rise in the protein content of the solution.

The turbidities could be scored as follows:

Turbidity of initial solution	(+)
,, ,, filtrate	(trace)
,, ,, residue	(++)

It will be observed that in the one experiment conducted with this material the filtrate contained a trace of protein. Whether or not this protein contained any of the active material has not yet been determined.

CANDLE ASSEMBLY FOR FILTRATION



Ultrafilter assembly ready for operation

Serum globulins

The *a*-globulin fraction was used in these experiments. The results obtained indicate that here again 0·5% agar provides a suitable film for ultrafiltration. Results from two experiments are shown in Table 6.

These filtrates contained a trace of protein, as shown by precipitation with salicylsulphonic acid. However, as was the case with intrinsic factor of stomach, the main increase in solid content was due to an increased concentration of protein.

Re-use of candles

Candles which had been coated with agar were used again for general bacteriological purposes after they were scrubbed in hot water for ½ hr., then had warm water forced through the pores for 16 to 20 hr. Having been treated thus, they were found to act as simple filters for bacterial toxins without detectable loss of efficiency.

Table 6.—Concentration of *a*-globulin by ultrafiltration

Material filtered through candles coated with 0·5% agar dried 12 hrs. at 35°C. Temperature during filtration 18°C. (±1°C.)

Expt. No.	*Initial total solid* (%)	*Total solid in filtrate* (*Gm.* %)	*Total solid in residue* (*Gm.* %)	*Volume filtered* (*Total*) (*ml.*)
1	12	0·17	19	800
2	12	0·16	20	950

DISCUSSION

The experiments just described serve to emphasise a use for agar which is not widely appreciated. Seiffert (1944) refers briefly to its successful use by Giemsa for virus ultrafiltration. Here it was applied to filter paper in a thin film, the paper thereby providing a porous support. Browne and Walsh (1941) described the use of " the flesh of many plants including those of the agave, sisal aloe and plants of like genus " in the manufacture of filters of various grades, including ultrafilters.

It may be useful to compare and contrast the process described by Browne and Walsh (1941) with that described above. In the published method, a porous host such as kieselguhr, or porous plate, was first impregnated with a solution of the vegetable colloid, this solution being of alkaline *p*H. The filter was then prepared by precipitating the solution to form a gel by treatment with acid or salt. Hydrochloric acid and calcium chloride were described as being suitable for the purpose of gel formation.

By contrast the method presented here does not involve acidification of an alkaline solution, all the operations being carried out near neutral *p*H (6·8-7·4). No chemical additives are involved. The cardinal feature of the process would appear to be the drying of the film, which rests upon the surface of the candle. The method is, therefore, much simpler in its conception and execution than is that of Browne and Walsh (1941).

Producing a stable film

This effect of drying in producing a stable film is most striking. Thus there is strong indication that a 0·5% solution produces a better ultrafilter than do stronger solutions, such as 2·5% agar, which would dry out less completely in a given time. This is again in contrast to the claim by Brown and Walsh (1941) that with precipitated gel filters the degree of filtration may be enhanced by strengthening the solution of plant colloid and at the same time strengthening the acid used for precipitation. Clark (1925) obtained results which clearly indicated that thoroughly dry agar would imbibe very little water. A temperature coefficient for this effect has not been well defined. Certainly at the temperatures employed in these experiments (16°-19°C.) the films

were very stable upon contact with aqueous solutions. It may well prove to be the case that efficiency of the films would be impaired at slightly higher temperatures.

All of the liquids ultrafiltered contained an appreciable concentration of electrolytes (between 0·10 and 0·20 N) and it was possible that these further reduced imbibition of water by the agar macromolecule. With the electrolytic concentrations present here, it is likely that dehydration and consequent integrity of the agar film would tend to be maintained by the valence effect of the cations present. Another dehydrating influence would be the lyotropic effect of both anion and cation present in the solutions which were filtered.

Efficiency of films

Such factors affect the efficiency of the films more profoundly than, say, the concentration of agar employed in its preparation. These concentrations were varied in the early experiments, so that lower and possibly upper limits of concentration could be found, outside which ultrafiltration was impossible. There is a suggestion of loss of efficiency with films prepared from 2·5% agar, but the bottom limit has not so far been defined. Whether it would be possible to prepare membranes of graded and predictable porosity by choosing carefully the range of concentrations of agar used is a matter which also awaits investigation. There is every indication that this might be possible and that very low concentrations of agar would be required for the purpose, *i.e.* a range from 1·0% down to say 0·1% or less. At the same time it would probably prove difficult to prepare a completely impermeable film using agar, since one might always expect some degree of adsorption of water and consequent development of semipermeability.

Advantages of agar

Agar provides the following advantages over collodion or collodion acetic acid membranes:

1. Films are quickly prepared and easily reproduced, *i.e.* specification of the properties expected in a film is easy.
2. Prolonged washing is not necessary, as is the case with collodion acetic acid.
3. The surface is not hydrophobic, as is the case with collodion ether membranes. Rates of ultrafiltration are, therefore, higher at any given degree of vacuum.
4. The method is cheap and readily adaptable to large-scale processes where multiple permeable supports could be readily treated with agar and used for large-scale concentration of proteins in solution.
5. Protein adsorbs or "sticks" more readily to an agar surface than it does to collodion. This protein cake can be washed off and an active principle recovered in highly purified form.

Agar is a comparatively unreactive substance and does not appear to have interfered with the chemical or biological properties of any of the protein solutions tried so far. The possibility of slight contamination of the liquids with which it comes into contact has not, however, been excluded.

It is clear that other water-soluble macromolecules could be employed in a similar manner as ultrafilters, and the properties of agar which render it useful for this purpose are being investigated, with a view to utilising as wide a variety of other colloidal substances as possible.

Acknowledgments

The authors wish to thank the directors of Evans Medical Ltd. for permitting the publication of these results. Special thanks are extended to Dr. D. Riding, medical director of the Evans Biological Institute, Runcorn, Cheshire, for providing facilities for the study, to Mr. R. A. Taggart, of that same institute, for help with the tests for antigens and to other members of the research and technical staff for their kind interest and criticism.

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H.M. Factory Inspectorate Directory giving information about the divisions and districts of H.M. Factory Inspectorate in Great Britain has been published by the Ministry of Labour. Details are given of the area covered by each district in a division, together with the address and telephone number of the divisional and district offices.

BOOTS' LABORATORIES

(Continued from page 482)

tively low activity and short life, the precautions to be taken do not need to be particularly specialised but are more a concern of everyday housekeeping. There is in this unit accommodation for animals; the precautions to be taken are identical to those taken with animals infected with dangerous organisms. A cobalt-60 source has been installed for some time in other premises and is used for various types of experimental work.

Isotopes give greatly improved scope for the study of the metabolism of drugs in the body and for the study of insecticides and weedkillers.

Pharmacological work with isotopes consists of labelling the test substance with carbon-14, injecting it and tracing its fate in the animal by Geiger counter. One-millionth of a gram can be detected in the liver by this means.

Services

As much as possible in the way of services is supplied centrally to the six floors. Two cage hoists are used, one to remove the dirty cages to the basement and the other to return the clean cages for use. A system of food delivery by means of which animal food is delivered down a chute to the requisite floor saves much carriage and storage.

Pharmaceutical legislation. A reprint of a paper presented by Mr. Allen Duckworth, secretary of the Association of British Pharmaceutical Industry, at the International Congress on the Problems of European Pharmaceutical Legislation, gives an account of the framework of laws and regulations in Great Britain governing the exercise of professional pharmacy and the manufacture and supply of pharmaceutical preparations of all kinds. It also outlines the provisions of the National Health Service with special reference to the pharmaceutical services; and includes a short summary of the law in so far as it is designed to protect industrial property rights and to encourage research and development in the pharmaceutical industry.

Properties of titanium. The first of a series of five booklets, to be published by I.C.I. Metals Division over the next few months, is now available. Titled *I.C.I. Titanium* (1)—*Wrought Products*, it describes the company's manufacturing facilities and production range, and indicates the principal outlets for titanium and its alloys.

Colgate-Palmolive's New Factory in Italy

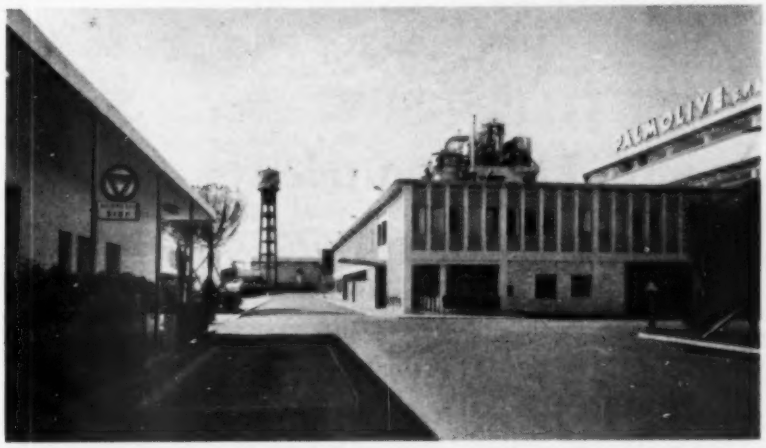
TEN MILLION DOLLAR FACTORY EMPLOYS ONE THOUSAND

A new factory which cost 10 million dollars has been opened at Anzio, Italy, by Palmolive S.p.A., a subsidiary of Colgate-Palmolive International. Twenty-one different products are manufactured. These range from synthetic detergents and soaps to the most widely-sold cosmetic articles which are packaged into more than 120 different items. The capacity of the factory is equivalent to about 85% of the total Italian market for soap, dental cream and detergents. Further expansion is possible in the future.

1000 employees

One thousand people are employed and their wages, the company's purchase of merchandise and services, and the payment of local taxes contribute a great deal to the economic development of the area.

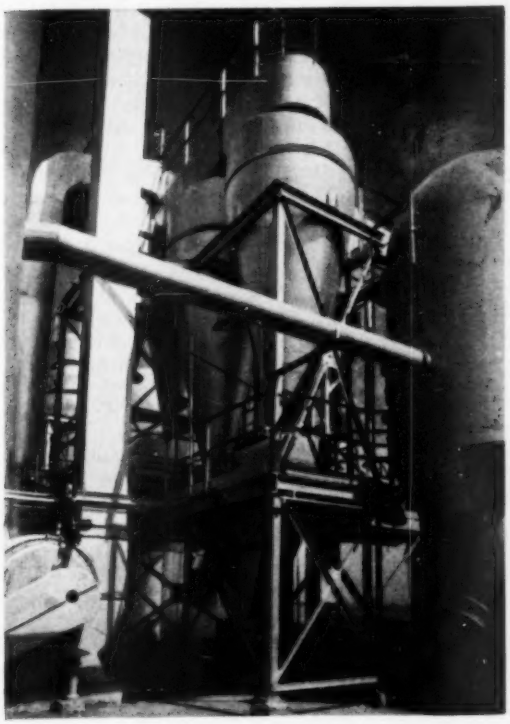
The movement in and out of the plant of raw materials and finished products has already reached the level of 120,000 tons annually. This activity is carried on in a number of ultra-modern installations located in a factory area of 14½ acres.



The entrance to the new 10 million dollar factory showing the plant offices. A thousand people handle 120,000 tons of raw materials and finished products annually

A transportation network assures a steady flow of raw materials through various stages of processing, and of finished products to warehouses and markets. One-and-a-half miles of internal railway connections lead to 36 fluid storage vats with a total capacity of 26,400 cu. ft. Also included are 31 miles of pipelines; complete laboratory facilities for analysis, research and control; and 29,900 sq. yd. of warehouse space from which finished goods are shipped to their various destinations.

A sewage system, 1½ miles long, collects rainwater and carries off all liquid waste from the plant.



Plant for the continuous production of detergents. The factory can supply 85% of Italian requirements of detergents, soap and dental cream

Power system

The power system includes a 3,000 kW transforming substation connected to a 60,000 V grid whose energy it transforms into the 10,000 V current needed for plant operation. A central panel directs 10,000 V current to five additional transformer stations which supply current at 380 and 220 V. Over 3½ miles of cables provide for the distribution of electricity and carry the power necessary for the operation of control circuits.

Steam power is produced by three Tosi boilers with a total capacity of 36 tons of steam per hr. A compressed-air system supplies power to automatically operated equipment.

Continuous production

In this factory, for the first time in Colgate-Palmolive's history, two Sharples units for continuous production of detergents are installed.

Special care has been taken in organising social services. The plant is equipped with a canteen, which can serve 25,000 complete meals per month; dressing rooms, showers and hygiene facilities. In addition, there is a hospital complete with beds and a group of special offices for the study of accident prevention, social assistance and training of personnel.

The new factory is part of the international Colgate expansion programme.

FERTILISERS and Plant Nutrients

By D. P. Hopkins, B.SC., F.R.I.C.

New manufacturing processes • Magnesium supply • Responses to potash • Sodium as a nutrient • Granulation of PK mixtures

New processes

Two papers have described new manufacturing processes or techniques experimentally developed by the Tennessee Valley Authority in the U.S. One of these, tested on a laboratory scale,[1] has produced NP fertiliser products from elementary phosphorus, air and ammonia. P vapour is combusted in air and the phosphoric acid produced is ammoniated at a temperature range of 250°-350°C. The reaction is complete within this range, but it is believed that the optimum temperature is 315°C. The resultant substance, a whitish fluffy powder, contains about 17% N and 80% P_2O_5. It is probably a mixture of ammonium metaphosphate, phosphonitrilic acid and the ammonium salt of the latter. The physical properties of this type of product would seem promising for fertiliser use. With N/P mole ratios of 0.98 to 1·08 caking or moisture absorption did not take place in exposure and storage tests. A range of products made exhibited low hygroscopicity. Water-solubility of the P content is very high and greenhouse tests showed comparable effectiveness with similar amounts of N and P applied as ammonium nitrate and superphosphate; subsequent crops also gave good responses, which suggests there is also a useful residual value. It is of interest that over 60 years ago it was suggested that phosphonitrilic compounds might be good fertiliser materials.

Liquid NP and NPK products

The second TVA paper[2] describes the utilisation of superphosphoric acid (see MANUFACTURING CHEMIST, 1958, 29, 117) in making highly concentrated liquid NP and NPK fertilisers. The advantage of superphosphoric acid is that higher analysis liquid mixtures can be made which do not "salt out" as readily as mixtures based upon ordinary phosphoric acid. Thus, with 76% superphosphoric acid, an 11-30-0 liquid product will not salt out unless the temperature drops to 32°F. or below; with 54% phosphoric acid, the most concentrated NP mix that will fulfil this condition is 8-24-0. When potash is also added (as muriate) there is, with superphosphoric acid as the source of P, a similarly wide range of freedom from salting out at lowish temperatures, liquid mixtures with analyses such as 10-10-10 and 5-15-10 being producible. It is stated that several U.S. manufacturers are already using superphosphoric acid in liquid compounding. In some cases in this TVA experimental work the source of N was not only ammonia from ammoniation, but urea or ammonium nitrate were also added.

Magnesium

There is increasing concern about magnesium supply in soils in north-west Europe, notably in Holland and Germany. Outbreaks of hypomagnesæmia in Britain have focused attention upon this problem, though this magnesium deficiency disease of cattle would seem more associated with animal metabolism than with magnesium uptake from soils. In the U.S.A. fairly large amounts of magnesium have been added to soils with ordinary fertilisers because of the use of dolomitic limestone as a filler-conditioner for powder-type compounds. With the developments of higher NPK analysis compounds and of granulation, the amounts of dolomitic limestone thus used have been steadily and markedly falling. Looking ahead to magnesium deficiency problems, authors of a new paper[3] propose the use of olivine or serpentine, which are magnesium silicate minerals, in superphosphate manufacture. The most favoured method of processing is that of jointly acidulating (sulphuric acid) olivine or serpentine and rock phosphate, following this with ammoniation; this leads to a magnesium ammonium phosphate product. Ammoniation gives successive precipitates of dicalcium phosphate and magnesium ammonium phosphate. The separate acidulations of olivine and rock phosphate, which are followed by mixing the resultant products, is not considered to be as effective a processing method.

An English paper[4] has discussed fertiliser developments in the Eastern Siberia area of Russia. Climatic transport problems make it essential for the large fertiliser needs of this region to be locally produced. However, the paper largely reports processes that "should" be developed or are being planned, and there is scanty evidence of any sizeable fertiliser production already in existence.

Potash

1955-57 field tests in Eastern England[5] have shown that for barley it is better to combine-drill potash than to apply it by broadcasting on the seedbed. The average of all results at various centres in the three years shows that higher yields came from 0·25 cwt. of K_2O drilled with the seed than from 0·5 cwt. of K_2O broadcast. Responses of barley to potash varied from year to year, the average gain per acre for 0·25 cwt. of K_2P drilled being 1·2 cwt. of grain, for 0·5 cwt. of K_2O drilled 2·0 cwt. of grain.

1956-58 tests with strawberries have been reported from Long Ashton,[6] showing that good yields over three years can be secured with low rates of phosphate supply and very moderate amounts of nitrogen,

provided that the potash level of supply, from the soil or from added fertiliser, is adequate. This work was carried out on soils already fairly satisfactory in potash contents, and for that reason the critical importance of potash, though indicated by responses to potash in some of the testing, is not emphatically demonstrated. If too much nitrogen fertiliser is applied, crop gains are offset by higher losses to botyritis. The soils used were low in available P, but only in the first season was there a response to phosphatic fertiliser, showing that this crop's P needs can be easily satisfied. In the cases of both these major nutrients, raising the leaf-content of N or P by fertiliser dressings does not necessarily lead also to higher yields. This " minimal " attitude towards N and P does not seem as definitely established for potassium. A more significant conclusion from the work is that for this type of cropping, where plant stock is not annual, leaf analysis is a superior method for estimating nutrient needs than soil analysis.

Sodium uptake

The position of sodium as a plant nutrient remains speculative, though some workers are satisfied that for specific crop plants it is a useful yield - raising but non - essential nutrient. The relationship between sodium and potassium uptakes is also unclarified, though again the Lehr theory—that sodium can substitute for some but not all potassium functions, and *vice versa*—is attractively plausible. A new paper[7] reports fundamental solution culture work on sodium and potassium uptakes. The plants tested were maize, soya-bean and radishes. There were marked differences between the plant species in sodium/potassium effects. Thus, with maize a low concentration of K in the culture solution stimulated higher sodium uptake, but this did not similarly occur with soya-beans. With radishes, the effect of potassium concentration had much the smallest effect upon amounts of sodium uptake.

The method used in this work was to grow test plants for three weeks, then to transfer them for 48 hr. to nutrient solutions of various potassium and sodium concentrations; the sodium uptakes could be easily checked because radio-labelled sources of sodium (Na-22) were used. On the assumption that the effect of rising potassium concentration could be mathematically extrapolated, the concentrations of potassium that would entirely prevent sodium uptake were estimated as follows: 0·037-N and 0·031-N for maize and soya-beans, and 10-N for radishes. This very large difference would seem to give powerful support to the Lehr theory of sodium effects on plants. Of these three test species, radishes alone have been classified as sodium-responding, and it is clear that this species' capacity to take up sodium is heavily independent of potassium supply conditions. It is a reasonable deduction that radishes are a specific sodium-liking plant species for which sodium has useful functions in its own right and not functions which can be readily carried out by potassium. The much lower potassium concentrations that would by presumption reduce sodium uptake to nil for maize and soya-beans similarly indicate that for these species of crop plants—not classified formerly as sodium responders—the useful function of sodium in its own right is small and economically unimportant. Unless it has been missed by the writer, there has been little research reported in which radio-labelled sodium has been used, and this new report supports modern theories about sodium's nutritional status.

Granulation of PK mixtures

An American paper[8] on the granulation of nitrogen-absent compounds is sharply relevant to granulation problems in this country. In the U.S. granulation has developed later than here and with basic differences for NPK manufacture, because there it has been possible to link ammoniation with the process of granule formation. However, when no nitrogen is required in the product, the American advantage cannot operate, and it is clear from this recent paper that difficulties have been experienced. The granules obtained from simple superphosphate-potash mixing and wet treatment were " not very strong "; a high percentage of moisture was required which made the subsequent drying process " difficult and expensive." Here mixtures of the potassic-super class have long been favoured for autumn use, and these have been granulated for some years. Manufacturing difficulties have not been widely discussed, however, and it is only a small exaggeration to say that each manufacturer has dealt with the difficulties in his own manner.

The American reaction to this special problem has been to combine rock phosphate acidulation with the granulation process, arranging to derive up to a third of the final available P_2O_5 content from raw phosphate acidulated simultaneously with wet granule formation. However, the success of this method may depend, as with ammoniation, upon the less stringent legal requirements in the U.S. for phosphate solubility. Even with combined acidulation and granulation, a moderate use of steam rather than water seems on the whole desirable for effective PK granulation—amounts of 50 lb. of steam per ton of product are mentioned.

A 1957 paper[8] on steam for granulation expressed the view that mixtures with a high superphosphate/salts ratio became more difficult to granulate with the introduction of steam, mainly because of greater oversize formation. The weak strength of PK granules, as reported from U.S. experience, can of course be substantially due to oversize production and breakdown in recycling. The formation of granules in the pre-drying stage is made easier if the mixture contains high proportions of a plasticising substance. This condition is satisfied with high-analysis PK mixtures, for superphosphate is a plasticising material. If steam is additionally used to promote rapid granulation, the proportion of over-large granules is likely to be increased. The problem is virtually the inverse of the situation when high N and K but low P compounds are required in granulated form, *i.e.* when there is a high salts content and a low " plasticiser " content. Published information on this subject has been scanty, and the American paper mentioned above is unhelpful because it combines a study of the simultaneous effects of partial acidulation and use of steam.

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Analytical Chemistry

By W. I. Stephen, PH.D., A.R.I.C.

Detergents ● *Fine chemicals* ● *Drugs and pharmaceuticals* ● *Antibiotics*
Steroids ● *Vitamins* ● *Essential oils*

THE analysis of detergent mixtures poses many difficult problems for the analytical chemist to solve. This applies not only to the analysis of commercial preparations, but also detergent residues in effluents and sewage. The latter analysis has caused much trouble to chemists particularly concerned with water conservation. This month's report begins with a discussion of recently described methods of detergent analysis.

Detergents

AT THE Unilever Research Laboratories in Holland, Voogt[1] has studied the analysis of detergent mixtures containing sodium salts of alkyl sulphuric or sulphonic acids, free fatty acids, and non-ionic material. By the selection of suitable ion-exchange resins, an ethanolic solution of the detergent can be separated into three fractions from three exchangers. The Dowex resins, 50-X8n(H), 1-X2 (acetate) and Dowex 2-X8 (OH), are suitable. The three fractions contain respectively strong acid, weak acid and non-ionic material; the acids can be titrated potentiometrically and from the data obtained the content and molecular weight of the acids can be calculated. The amount of non-ionic material is obtained by evaporation of the ethanol and weighing the residue. Sodium dodecylsulphonate and sodium dodecoate were used as test materials.

The presence of ethylenediaminetetra-acetic acid in cleansing agents and detergents as a softening agent is readily shown by making use of reddish-pink cobalt (III) EDTA complex formed in weakly acid solution.[2] A portion of a 10% solution of the sample is treated in a colorimeter tube with glacial acetic acid, cobalt nitrate solution and 100 volume hydrogen peroxide. The resulting pink colour is then matched with colours obtained using various amounts of 0·1% disodium ethylenediaminetetra-acetic acid. Shampoos containing alkyl sulphates and fatty acid-alkanolamine condensates cannot be analysed by the normal solvent extraction procedures.[3] Instead the alkyl sulphate is adsorbed from an acidified ethanolic solution on to a weakly basic resin, such as Amberlite CG-45, type 2, and removed with methanol containing ammonia and ammonium carbonate. The acid eluate is then evaporated and the dried residue is extracted with acetone. The residue from the evaporation of the actone extract is then weighed.

Fine chemicals

4 - Aminophenazone (4 - amino-antipyrin) is recommended[4] as a reagent for the identification and determination of cyclic aldehydes. Dilute solutions of such aldehydes form difficultly soluble Schiff's bases with the reagent. These crystallise in forms which are readily identified by microscopic examination. A semimicro photometric procedure has also been described. In a series of papers, Schulek and Burger[5] have described the halogenation of aromatic compounds in aqueous solution with bromine chloride. Recently this reagent has been used to determine phenolic compounds which readily undergo bromination. Under the experimental conditions, bromination is extremely rapid, and it is possible to determine salicylic acid in the presence of aspirin.

The detection of phenols on paper chromatograms is effected by spraying the dried chromatograms with a dilute methanolic solution of 2 : 6-dibromo-*p*-quinonechlorimine.[6] On drying the paper with hot air certain phenols show immediately, others require a spray of 0·1% sodium bicarbonate. The tests are sensitive to about 1 μg. of most phenols. Another method of detecting phenols under similar circumstances involves spraying the paper with a saturated aqueous solution of ammonium vanadate, then with an ethanolic solution of *p*-anisidine containing some phosphoric acid,[7] the phenols show up as orange-yellow spots on a red background of anisidine vanadate; this red background fades on drying but the colour of the phenol spots is quite permanent.

A recent study[8] of the quantitative separation of organic bases with ammonium reineckate shows that the reactions involved depend on the basicity of the compounds and the *p*H of the reaction medium. If the dissociation constant of the base is known, it is possible to calculate the *p*H necessary for the formation of the reineckate complex. For example, it is shown that the very weakly basic urea forms a reineckate in strong acid media. Mixtures of bases with dissociation constants sufficiently far apart are separated as reineckates by appropriate adjustment of the *p*H of the solution.

Drugs and pharmaceuticals

Contrary to previously reported experiences, hexobarbitone and phenobarbitone can be determined by argentimetric methods.[9] The experimental conditions must be accurately controlled, and this applies particularly to the *p*H. If the titration is carried out in an alkaline, ethanolic solution, the alkaloid bases, phenazone, amidopyrine, caffeine and small amounts of bromide do not interfere. A new reaction for the detection of barbiturates on paper chromatograms based on Zwikker's reaction has been described.[10] The paper is treated first with a solution of a copper-pyridinium salt and then with 0·001*M*-EDTA. The spots are detected by immersing the paper in a solution of sodium diethyldithiocarbonate. This method allows for the detection of 10 μg. of barbiturate after chromatographic separation, or 5 μg. when used as a spot test. Uracil and thiobarbiturates behave similarly, but not the 1-alkylbarbiturates which cannot undergo enolisation in the 2-position. Rentsch[11] uses the solvent system, pyridine, water, aqueous ammonia, in the proportions 7 : 3 : 1 for the separation of barbiturates by a descending technique on paper saturated with 1M-potassium nitrate. The barbiturates are detected by the addition of chlorine to the amide group following the method of Zahn and Rexroth.[12] A nephelometric method for phenobarbitone makes use of mercuric perchlorate as reagent.[13] A Pulfrich

nephelometer is used and the relative and absolute turbidities of the solutions and their relation to the concentration of phenobarbitone are determined. An error of less than ±4% is attainable on 0·1-0·35 mg. of phenobarbitone.

Non-aqueous titrimetry is finding considerable application in pharmaceutical analysis. German workers[14] describe the visual titration of some 20 organic bases with perchloric acid. The indicator "Fett blau" gives the best results. Substances analysed include isoniazid, methylamphetamine, codeine, choline and amidopyrine. Similar work by Americans[15] has concerned the titration of organic bases in chlorobenzene as solvent with potentiometric or visual detection of the end-point. Titrations of atropine show recoveries of 99·7% with a standard deviation of 0·55%.

The gravimetric determination of camphor as its semicarbazide[16] has now been applied to the determination of camphor in a variety of pharmaceutical preparations.[17] The original method is only slightly modified. Several methods are proposed for the determination of nicotinaldehyde thiosemicarbazone.[18] Direct titration in strong alkali with standard iodine solution can be carried out potentiometrically. Alternatively, an aqueous solution of the compound can be hydrolysed by boiling with alkaline cadmium hydroxide. The cadmium sulphide so formed can be filtered off, washed and determined iodimetrically. Polarographic techniques can also be applied.

Certain organic bases such as quinine, cinchonine, strychnine and some antihistamines can be titrated amperometrically with 0·1N-nitranilic acid in a supporting electrolyte of 0·01N-potassium chloride at −0·5 volt against the S.C.E.[19] Other bases have also been studied, but in these cases the errors are considerable because of the relatively high solubility of the nitranilates formed.

A new redox titration has been described for the determination of phenothiazine compounds.[20] Substances such as promethazine, diethazine, chlorpromazine and prochlorperazine can be titrated with ceric sulphate or bromate-bromide using the dead-stop end-point technique. When one equivalent of oxidant has been consumed, the red colour of the solution reaches a maximum, as does the current intensity; both fall to a minimum when two equivalents of oxidant have been added.

The quantitative determination of piperazine in pharmaceutical preparations has been effected by precipitation of the tetraphenylborate or the reineckate.[21] Both salts can be determined titrimetrically; the former by the well-known argentimetric procedure described by Rüdorff and Zannier, the latter by hydrolysis and a Volhard titration. The two methods are accurate to about 99 ± 0·5%.

A recent study[22] of the reserpine content of rauwolfia root has involved a comparison of an earlier method by Banes and his co-workers[23] and the method of Hayden and co-workers. The nitrite method of Banes tended to give high results (*ca.* 15%) probably because of the presence of other colour forming alkaloids. Evans[24] has studied the i.r. and u.v. absorption spectra of the reserpine alkaloids.

Antibiotics

The procedures of non-aqueous titrimetry can be applied to the determination of the tetracycline antibiotics and certain preparations containing these antibiotics.[25] About 50 mg. of sample are dissolved in nitromethane containing some benzene and formic acid. The solution is then titrated with a solution of perchloric acid in dioxan, the end-point being detected either visually or potentiometrically. A suitable indicator for the visual end-point is a mixture of methylene blue and quinaldine red in anhydrous methanol. Variations in the solvent systems are made when pharmaceutical preparations are being analysed. A paper chromatographic technique is used by Russian workers[26] to determine the relative amounts of tetracycline and chlortetracycline in culture fluids, particularly those of *Actinomyces aureofaciens*. Portions of the culture media are subjected to chromatography with a mixture of *n*-butanol, acetic acid and water in the proportions 2 : 1 : 1. The dried chromatograms are subsequently examined under u.v. light and the orange-yellow spots containing the antibiotics are extracted with 2N-hydrochloric acid at water-bath temperature. The resulting hydrolysates are then examined photometrically and the concentration of antibiotic is obtained by reference to a standard curve.

Steroids

Sesame-oil solutions of testosterone and testosterone *cyclo*pentylpropionate have been analysed by countercurrent separation followed by spectrophotometric determination.[27] The separation is effected with a 10-stage apparatus. The spectrophotometric identification and determination are based on an extinction coefficient of 565 for testosterone at 240 mμ and 409 for the *cyclo*pentylpropionate at the same wavelength, in ethanol solution. Steroid esters can be determined spectrophotometrically by reacting them with a solution of hydroxylamine in methanolic caustic soda.[28] Reaction times vary from a few minutes to 1 hr. depending on the ester being analysed. At the conclusion of this initial reaction the solution is treated with ethanolic ferric perchlorate and the extinction of the solution is measured at 530 mμ. A standard analysis is carried out at the same time. Results show exceptionally good recoveries of steroids.

American workers have developed a quantitative paper chromatographic method for the assay of prednisolone in tablets.[29] The method is stated to be too time-consuming for routine use, although it is useful for assessing the value of other methods and perhaps also of assaying aged preparations. It has the advantage that excipients and degradation products do not interfere. For routine purposes, a method based on chloroform extraction and subsequent reaction with 2 : 3 : 5-triphenyltetrazolium chloride is preferred.[30] Prednisolone in tablet form has been determined by a polarographic method. The procedure is accurate to ±1% for samples containing 5 mg. of the steroid.

Vitamins

Indian workers have studied the determination of folic acid in the presence of iron salts, such as ferrous gluconate or ferric ammonium citrate, by the U.S.P. XIV absorptiometric method.[31] The use of EDTA is recommended as a suitable masking agent for the iron. When exsiccated ferrous sulphate is present the iron is best removed by precipitation with trisodium phosphate. The same method is affected by the presence of ascorbic acid, but this interference can be overcome by increasing the concentrations of the sodium nitrite and ammonium sulphamate reagents.[32]

The estimation of vitamin B_{12} has been studied by Sharif.[33] He recommends determining the cobalt colorimetrically with nitroso-R-salt at 550 mμ. About 100 μg of the vitamin (containing about 4μg. of cobalt) are required if accuracies of about 2% are to be attained.

Numerous methods are still being advocated for the determination of ascorbic acid. Hungarian workers[34] recommend the use of starch-iodide indicator in the titration of ascorbic acid with standard potassium bromate. The acidity of the titrated solution must be high, about 4-5N with respect to hydrochloric acid. Sant[35] describes a ferricyanometric method in which the sample solution is treated with zinc acetate, 2-3 drops of potassium iodide and starch indicator. This solution is titrated with standard potassium ferricyanide until one drop of ferricyanide in excess causes the liberation of iodine with resulting blueing of the starch. The zinc salt precipitates zinc ferrocyanide formed by reduction of ferricyanide and it also maintains an acetate buffer of *p*H 6. Amounts of ascorbic acid between 1·90 and 95·0 mg. have been satisfactorily determined. Smaller amounts require the use of a more dilute ferricyanide solution. Potentiometric and amperometric titrations have also been used to determine vitamin C.[36]

Aqueous permanganate oxidises ascorbic acid to dehydroascorbic acid, further oxidation being prevented in the presence of potassium iodide. A potentiometric method based on this reaction enables quantities of the order of 1 mg. or less to be determined with accuracies better than ±1·5%. An applied potential of −1·0v. (against the S.C.E.) is used for an amperometric method. A further titrimetric method stated to give good results for the determination of vitamin C in coloured preparations depends on the reduction of mercuric chloride to calomel and the subsequent iodimetric titration of the precipitated calomel. The method gave recoveries of from 99·7-100·0% on 25 mg. amounts of ascorbic acid added to three different preparations. A number of compounds of the reductone type (reductonic acid, reductone, hydroxytetronic acid), compounds containing the sulphydryl group (the amino-acids, cysteine, glutathione and their derivatives), sulphur dioxide and natural organic dyes interferes with the determination of ascorbic acid in food products. A recent paper[37] from Czechoslovakia describes these interferences and gives suggestions for overcoming them by making use of newer methods. Unfortunately the abstract of this paper gives no hint of which method is to be preferred.

Recent work[38] on the analysis of the D-group vitamins by paper chromatography involves the use of paper impregnated with liquid paraffin. About 100 μg. samples are taken to minimise the losses arising from the instability of the vitamins during the analytical procedure. The determination is completed spectrophotometrically on eluates of the chromatograms.

Essential oils

The analysis of essential oils has been considerably simplified by the application of the techniques of vapour phase chromatography. A recent paper,[39] concerned with the analysis of citronella and lemon-grass oils has provided results for the composition of citronella oil (citronellal, citronellol and geraniol) and of lemon-grass oil (α- and β-citrals) which are several per cent. lower than those obtained by the conventional chemical methods. A significant fact is that synthetic mixtures of the constituents of these oils can be analysed with an accuracy of 0·5%. Gas chromatography has also been used to study the composition of various terpene hydrocarbons.[40]

A chemical method has been used to determine carvone and various other ketones in essential oils, particularly caraway oil.[41] The procedure is a colorimetric one in which the sample in ethanol is treated with an ethanolic solution of ethyl 3 : 5-dinitrobenzoate in methanol. The maximum extinction of the resulting coloured solution is measured at 537 mμ. The method is sufficiently accurate for practical purposes and can be applied to crude caraway oil if it is first treated with activated charcoal. The detection of low molecular weight fatty acid esters in essential oils has been described.[42] A drop of the essential oil is dissolved in ether and a solution of hydroxylamine in methanolic caustic soda is added. This mixture is maintained at 25°C. for 20 min., and it is then neutralised with a drop or two of concentrated hydrochloric acid and well shaken. The precipitated sodium chloride is filtered off and the ethereal solution is reduced to a small volume and is treated with methanolic ferric chloride. A very small portion (0·01 μl.) of this solution is subjected to chromatography on paper impregnated with methanolic ferric chloride using an ascending technique and the solvent system, *n* - butanol - dimethylformamide - water (9 : 1 : 10). On drying the chromatogram at 60°C., the iron (III)-hydroxamic acid complexes show up as violet spots on a yellow background. The oils examined include lavender, parsnip and valerian. A number of physicochemical characteristics for *trans*-isoeugenyl acetate and *trans*-benzyl-*iso*eugenyl ether is given by Levi.[43]

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(*Continued from page* 480)

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Spreading Like Butter

The similarity, in rheological terms, between spreading butter and applying face cream was discussed by the Society of Cosmetic Chemists at a London meeting addressed by Dr. G. W. Scott Blair, whose subject was the rheology of pastes, suspensions and emulsions.

Dr. Scott Blair defined rheology as the study of the deformation and flow of matter. This study could be extremely complex and initially simple systems were generally taken as prototypes, namely those exhibiting either Hookean behaviour, like a steel spring, or Newtonian properties in which the rate of flow is directly proportional to the force applied. Most simple liquids are in the later category.

The introduction of a second phase, whether solid or immiscible liquid, into the Newtonian system results in suspensions, pastes and emulsions. Here the relationships become more complex and combinations of springs, dashpots and sliders (to allow for static friction) have been used in the analytical representation of the various modes of behaviour found in practice.

The Einstein equation relating the viscosity of a dilute suspension to that of the pure liquid and the fractional volume occupied by the disperse phase requires modification when applied to emulsions. An indication of the complexity for suspensions may be gained by the fact that some 40 modified equations have been quoted.

Slides were shown illustrating the many types of behaviour which have been found: *e.g.* the variation of apparent viscosity with the diameter of capillary used and examples of thixotropy and dilatancy.

In an investigation into the ease with which butters could be spread on bread a special apparatus had been designed which closely simulated a spreading action. The results obtained, however, did not show a very high correlation with the results obtained by a panel of consumers. By extruding the butter through an orifice under a standard pressure results were obtained which gave an extremely high correlation with those of the consumer panel.

Dr. Scott Blair gave a striking demonstration of dilatancy by preparing a paste of cornflour and water in an evaporating basin. On holding the basin vertically the paste was seen to flow quite readily, but when suddenly jerked in the direction of the audience none of the paste left the basin.

In reply to questions on dilatancy it was stated that the actual volume of the disperse phase would undoubtedly be greater than that calculated in many instances, due to solvation of the particles. It was not thought that the presence of dilatancy in a paste was necessarily always associated with the 74:26 volume ratio calculated for a dispersion of close packed spheres of equal dimensions.

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Benzylamine. Robinson Brothers Ltd. have issued data sheets on benzylamine and dibenzylamine. Properties, formulæ and reactions are given, and a comprehensive list of references is also included. Both products have uses as intermediates in the preparation of penicillin salts, bacteriostats, pesticides and anticonvulsants.

PLANT AND EQUIPMENT

▶MELTING POINT APPARATUS

Electric melting-point apparatus made by Electrothermal Engineering Ltd. consists of a base housing the controls, a heater with a shielded metal block to receive three capillary tubes, and a thermometer. An optical system for illuminating and viewing the capillaries is also provided.

The block has a central hole for the thermometer and three holes, equidistant from the thermometer, for capillary tubes. It is surrounded by a borosilicate glass sleeve to eliminate excessive air currents and temperature gradients. Low heat capacity and high conductance of the block are said to facilitate rapid cooling. The heater is a resistance winding clamped to the bottom of the block, and power input is provided at low voltage and can be varied to give different rates of heating.

A thermometer has been developed which is said to achieve the accuracy required over the whole range of 20° to 360°C., while it is claimed that the risk of zero migration has been virtually eliminated by the use of borosilicate glass.

Lighting is by two 6·5 V. 0·3 A. bulbs, and the non-adjustable deep focus lens used in the apparatus is stated to give good viewing of the samples without critical adjustment of the lens or the viewing position of the operator.

Electric melting point apparatus works over the range 20°–360°C.

▶LABORATORY OVEN

The *Quadrate* laboratory oven made by Charles Hearson and Co. Ltd. is designed for operation at temperatures up to 200°C. Constructed of welded mild steel, rustproofed and finished matt black internally and stove enamelled silver grey externally, the oven has a working space of 12 in. × 12 in. × 12 in. Heat breaks are situated between the liner and the outer case and the inner and outer faces of the door. A soft asbestos gasket is used as a seal between the door and the faces of the liner, and two shelves are supplied.

There are two ⅜ in. dia. tubulures in the bottom of the liner, and a large adjustable ventilator, with provision for a thermometer, is fitted in the top. The heater is a 500 watt woven mat type and the oven is insulated by 2½in. thick fibre glass slabs.

A thermostat setting knob, on a nominal scale, and mains and control indicator lamps are situated on the front panel at the bottom of the oven. A hydraulic-type thermostat is said to give a maximum temperature fluctuation of ±3°C.

▶AUTOMATIC ACID HANDLING

Remote control of the transfer of concentrated hydrochloric acid in measured quantities from storage to process vessel has been achieved in an industrial installation now nearing completion. Here, storage tanks outside the factory building are elevated sufficiently to give gravity feed to the measuring vessels, which consist of calibrated, vertical cylinders, fitted with electronic level detectors coupled to the control system. Movement of acid in the system is effected by compressed air, by way of specially designed pinch valves operated by high-pressure air cylinders and servos. All pipelines are of acid-resisting plastic material or rubber-lined steel pipe.

An electric, push-button system controls the entire process automatically. When the measured charge has been admitted the valves shut and the measuring vessel is vented so that it is filled by gravity and available for the operation to be repeated. In this installation two measuring vessels each feed a battery of 8 process vessels with 250-gal. charges. The 16 process vessels are subsequently emptied by similar control methods.

The system is protected by interlocks from possible errors in operation and visual and audible signals are provided to give clear indication of what is happening at any given moment. Overriding direction of the whole process is exercised in this instance from a programme control panel fitted in the production manager's office.

▶TABLET DUSTER

A tablet duster which incorporates a static-eliminating device, in combination with a light air-stream and vibration, comprises an open-mesh chute 6 in. wide and 22 in. long, descending in three steps to provide two turning actions. This chute is vibrated mechanically to keep the tablets flowing down its length from the discharge point of the tableting press until they drop into the drum or barrel.

As they descend, the tablets pass under two dusting stations in sequence. Each station consists of a static eliminator bar, running across the chute, and an air-discharge tube with a series of small circular vents, which directs a light air-stream downward upon the tablets as they pass. The static eliminators produce a high-voltage discharge which ionises the air and thus neutralises the static charge on the dust particles, while an air-pressure of 20 p.s.i. is said to be effective for dusting. A dust-receiver, beneath the lower portion of the chute, traps the removed dust and permits it to be recovered and reused.

All parts of the duster that come in contact with the tablet materials are of stainless steel, and the controls are grouped at one side of the housing. These control air stream volume and amplitude of the vibrator, and include a three-position on/off switch which enables the duster to be run either with or without the static eliminator.

Centrifuge with stainless steel contact parts.

The housing of the duster is designed to fit on the tableting machine worktable or, if desired, it can be supplied with its own pedestal, mounted on castors, so that it can be moved from one press to another according to the nature of the material being tableted.

▶STAINLESS CENTRIFUGE

A centrifuge for use in the chemical industry is being offered in a range of sizes from 18 in. to 60 in. in basket diameter, giving capacities from 0·75 to 14 cu. ft.

The basic machine consists of the bedplate, suspension columns, pendulum suspension and outer casing, all constructed of mild steel; the centre-piece of cast iron houses a high-tensile steel spindle set in ball bearings. The machine is underdriven, having the driving unit fixed to the outer casing, and V-belt drive through a centrifugal free-shoe automatic clutch to a V-belt brake and drive pulley situated on the centre spindle.

The brake is of the spring-compression type, with a *Ferodo*-lined brake band. Once applied, it is completely automatic and the current is cut off.

A variety of designs is available, including one in which all contact parts of the machine are of stainless steel. Filter strip retaining rings can be fitted inside the basket. The drive unit is a special high-torque electric motor, either totally enclosed and fan-cooled or flame- and explosion-proof and fan-cooled.

For more information about the plant and equipment described please use the coupon on page 514

BOOK REVIEWS

Source Book of Industrial Solvents

By I. Mellan. Reinhold, New York, and Chapman and Hall, London. Pp. 276. 80*s. net.*

THIS is volume 3 of Mr. Mellan's series and it deals with the monohydric alcohols. These, of course, are very widely used solvents, so the book will be a useful informant and guide to chemists in many industries. The aim is to describe the physical properties, azeotropic mixtures and uses of these solvents. There is also a most interesting historical section on the early production of solvents by malting and brewing leading up to present-day syntheses — Fischer-Tropsch, Isosynthesis, Oxo process and the Oxyl process. There are many tables and production statistics.

The book is a most competent production and it is well printed and bound. But the price seems high.

Who Owns Whom

Vol. 1. *Pp.* 244 £4 4*s. net. Vol.* 2 *Pp.* 118 £3 3*s. net, the set* £6 6*s. net. O. W. Roskill and Co.* (*Reports*) *Ltd. London,* 1959.

ALTHOUGH take-over bids have only recently become newsworthy, mergers and acquisitions have been going on quietly for years. Diversification has been the watchword of businessmen, and in pursuit of this aim some odd families have been created. In fact some companies may have got more diversification than they bargained for and find themselves in businesses about which they do not know enough to run successfully. Perhaps there may be a reaction against diversification. In the meantime it is very useful to be able to turn to these volumes to discover just who your customer, supplier or competitor might be. Who knows? Perhaps you may find that one of your customers is a subsidiary of your parent company. Or, worse still, that your bitter rival is one of the family.

Volume 1 lists in alphabetical order 15,000 subsidiaries and associated companies. Column 1 names the subsidiary, column 2 the parent and column 3 the industrial classification of the parent (there are 14 classifications). Volume 2 shows things in reverse; it lists the parent companies with their subsidiaries. Both volumes are confined to public companies in industry and commerce. Banks and insurance companies are not, therefore, included.

The directories are quite fascinating. Their value to the alert businessman is obvious and unquestionable.

A Guide-Book to Biochemistry

By K. Harrison. Cambridge University Press. 1959. *Pp.* 150. *Cloth* 17*s.* 6*d., paper* 10*s.* 6*d. net.*

THE author of this guide-book, like Baedeker, covers a very great deal of ground in a somewhat indigestible manner.

The indigestibility is the fault of the subject rather than of the author. Biochemistry is based on the complexities of physical and organic chemistry, and its applications extend to various branches of biology and to a limitless variety of living organisms. It is therefore far from being an easy subject to summarise.

This book will be appreciated by specialists in other fields who feel the need of constant refresher courses to give them some notion of modern trends in biochemistry. It will also prove a useful reference book to the serious student of chemistry or biology.

An introductory chapter gives a brief account of the scope and objects of biochemistry, and concludes with the comforting reflection that Nature is less varied in its chemical machinery than in form. Further chapters deal, in a condensed but far from elementary manner, with energy, enzymes, oxidation, photosynthesis, and carbohydrate, fat and protein metabolism.

Though a masterly summary, this is heavy reading, and would be quite unintelligible to any reader not possessing a fairly extensive grounding in organic chemistry. The suggestion on the publisher's dust-jacket that this book may decide the intelligent sixth-former to take biochemistry as a university subject is probably over-optimistic. A simple introduction and invitation to a

subject so complex as biochemistry—if possible at all—could only be achieved by drastic cutting of detail and consequent loss of "meat."

However, most readers who purchase this book for their personal reference library will probably gladly forgo simplicity for the sake of the meat, which is plentiful and authentic. The book is admirably produced and low in price, and should find a place on every scientific bookshelf.

L. D. GALLOWAY.

Index of Chemistry Films

Royal Institute of Chemistry, London. Pp. 150. *5s. post free.*

THIS Index aims to bring together in one volume details of all films and filmstrips on chemistry and related topics that are available in this country. It is designed to cover the requirements of schools, technical colleges, universities and the training departments of industrial firms, and it includes films and filmstrips of many types, from those of an elementary nature up to research films.

The major sections of the Index consist of lists of about 800 films and 200 filmstrips, classified by subjects. These are followed by the addresses of distributors and an alphabetical list of all the titles included.

It is intended to publish new editions at suitable intervals so that a reasonably up-to-date Index will always be available.

Kosmetische Chemie

Huthig Verlag, Heidelberg. Pp. 310.

THIS little book—it is paper backed and measures 4¼ in. by 7½ in.—is a report of the Congress of the German Society of Cosmetic Chemists which was held in Bonn in September 1958. It contains the papers given at the congress in the following classifications: hair chemistry (4 papers), chemistry and biochemistry of emulsions (4), chemistry and biochemistry of aromatics and essential oils (9), techniques (5).

The text is German, but each paper has a useful summary in English which will help English-speaking readers to decide if it is worth while struggling through with their own knowledge of German or getting a proper translation. There are several photographs, some in colour. The book is a worthwhile contribution to cosmetic science.

Meetings

Society of Cosmetic Chemists

January 18. "Use of Polyoxyethylene Derivatives in Cosmetics," by B. A. Killner. 7.30 p.m. Royal Society of Arts, John Adam Street, London, W.C.2.

Chemical Society

January 6. "Aescigenin," by J. B. Thomson. 5.30 p.m. University College, Upper Merrion St., Dublin.

January 8. "Radiochemical Analysis," by Dr. J. N. Andrews. 6.30 p.m. College of Technology, Ashley Down, Bristol 7.

January 8. "Chemistry Applied to Criminal Investigation," by J. K. McLellan. 7.30 p.m. North British Station Hotel, Edinburgh.

January 12. "The Chemical Contribution to Cancer Research," by Prof. A. Haddow. 5 p.m. Queen's College, Dundee.

January 14. "Progress in the Study of Heterogeneous Catalysis," by Prof. C. Kemball. 7.30 p.m. Royal Institution, Albemarle St., London, W.1.

January 15. "Alkali Metal Derivatives of Organic and Organometallic Compounds," by Prof. G. E. Coates. 4.30 p.m. The University, Birmingham.

January 18. "Chelatometry," by Dr. T. S. West. 5 p.m. University Chemical Laboratory, Lensfield Road, Cambridge.

Institution of Chemical Engineers

January 20. "Refrigeration Practice," by Mr. Perry. 6.30 p.m. Lecture Theatre A, Houldsworth School of Applied Science, The University, Leeds 2.

January 26. "Rotating Band and Spinning Band High Vacuum Distillation" (Authors to be announced later). 6.30 p.m. Manchester College of Science and Technology, Jackson St., Manchester.

Society of Chemical Industry

January 11. "Emulsions in Theory and Practice," by Dr. C. G. Sumner. 5.30 p.m. 14 Belgrave Square, London, S.W.1.

January 12. "Critical Examination and Joint Technological Approach to Project Work in the Chemical Industry," by H. Birchall and D. S. Binsted. 6 p.m. 14 Belgrave Square, London, S.W.1.

Institution of Plant Engineers

January 5. "The Use of Plastics in Engineering," by C. L. Child. 7.30 p.m. White Lion Hotel, Church St., Peterborough.

January 13. "Safety in Factories." 7.15 p.m. Royal Society for the Prevention of Accidents, 1A Queen's Square Avenue, Bristol.

January 14. "Pipeline Cleaning Techniques," by M. Webb. 7 p.m. Roadway House, Oxford St., Newcastle upon Tyne.

Society for Analytical Chemistry

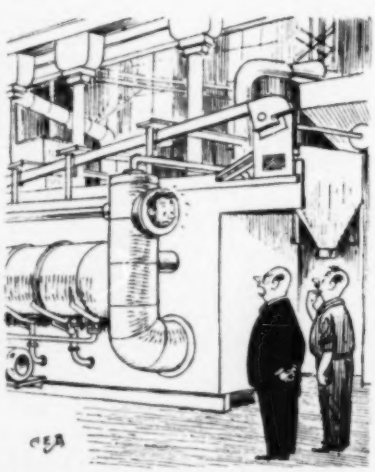
January 8. "Infra-red Spectroscopy," by L. J. Bellamy and D. M. W. Anderson. 7.15 p.m. 22 George St., Edinburgh 2.

January 8. "Radiochemical Analysis." Bristol and District Section of the R.I.C. Bristol.

January 12. "Modern Methods of Micro-gas Analysis," by G. J. Minkoff. 6.30 p.m. The University, Birmingham 3.

Bookshop Service

All books reviewed in MANUFACTURING CHEMIST and all other scientific or technical books may be obtained from: Technical Books, 308 Euston Road, London, N.W.1. Telephone: Euston 5911.



"IT'S CARELESSNESS LIKE THIS, WILLIAMS, THAT CAUSES TROUBLE WITH THE INSPECTOR OF FACTORIES"

Trading with the Soviet Union. A comprehensive guide for British firms has been prepared by the Russian Department of the London Chamber of Commerce under the title "Trading with the Soviet Union." It describes the Soviet trading system, the market potential and methods of trading. It also gives guidance on such matters as export/import licensing contract terms, documentation, patents, designs and trade marks, advertising and postal and telecommunications services.

Trading with the Soviet Union is published at 5s. post free and copies can be obtained from the London Chamber of Commerce, 69, Cannon Street, E.C.4, or through any Chamber of Commerce affiliated to the Association of British Chambers of Commerce.

NEWS . . .

Sturge take first step in £100,000 research plan

New laboratories for organic and biochemical research work have been opened at Wheeleys Road, Birmingham, by John and E. Sturge Ltd., as part of a £100,000 plan to centralise the company's research work.

One of the main activities will be fundamental research on fermentation problems, particularly in connection with the microbiological production of citric acid, involving a close study of the biochemical and chemical aspects of the life cycle of *Aspergillus niger* and the undertaking of an extensive mutation programme.

The well-equipped laboratories include an instrument room which is maintained at a constant temperature of 20°C., a special cold room for enzyme manipulation in which the temperature can be kept down to 0°C. indefinitely, and sterile air-conditioned rooms to facilitate the handling of micro-organisms. The existing physical chemistry research laboratories at Wheeleys Road have been modernised, and are now fully equipped for radiochemical and high vacuum work and for ultra-violet spectroscopy.

At the company's Lifford Chemical Works, Birmingham, the analytical laboratories are being extended to cope with the testing of increased production, and the development laboratories have been rehoused in larger premises and now include a section for technical service work on rubber, plastics, paper, paint and printing inks.

The Yorkshire laboratories at the company's Selby works—formerly devoted to the organic and biochemical research work—are now being used to extend the facilities of the development, analytical and microbiological departments. Construction work will start shortly on a new fully-equipped pilot plant, together with an associated laboratory and administrative offices.

The entire programme will be completed by the end of 1960.

Research centre planned by Miles Laboratories

Miles Laboratories Ltd. of London, W.1, have appointed Dr. Charles E. Dalgliesh. M.A., PH.D., SC.D., to their board.

As research director, Dr. Dalgliesh will head a new research division which the company is forming in Great Britain. This division will set up the Miles-Ames Research Laboratories which will constitute a major research centre for the Miles group of companies—a world-wide organisation of which the parent company is Miles Laboratories Inc., with its own research laboratories at Elkhart, Indiana, U.S. This is the first time this organisation has set up a basic research centre outside the American Continent.

Dr. Dalgliesh was appointed Lecturer in Biochemistry at the Post-graduate Medical School (University of London) in 1952 and was later appointed Senior Lecturer, which appointment he held until he joined Miles. He was also for many years Honorary Secretary of the Biochemical Society.

Miles Laboratories Ltd. has bought Stoke Court, Stoke Poges, Bucks. This is an old country mansion of historic interest in which, after restoration and conversion, it is planned to establish the new research division and laboratories. It will also house the headquarter offices of the company, together with the sales and administration departments. The work of restoration is already going ahead, and it is expected that the new headquarters will be ready for occupation next summer.

Newton Chambers' £300,000 rebuilding scheme

Newton Chambers and Co. Ltd., of Thorncliffe, Sheffield, plan to spend more than £300,000 on a new chemical works and central laboratory block. The present works—where *Izal* disinfectant was developed—are to be replaced by modern facilities. Building will commence in April and it will be carried on so as not to interrupt production. The main production building will be completed at the end of 1960 and it is aimed to complete the whole programme, including the laboratory block, by the end of 1961. The new chemical works will produce disinfectants, detergents, washing creams, insecticides, barrier creams, cutting oils, etc.

Coal chemicals committee wants more evidence

The Government committee studying the prospects of developing a coal-based chemical industry want information from people interested in the industry. Specifically, they want written memoranda from people interested in research and development on processes for making chemicals, gases and oil from coal and in the organisation of such work.

This was announced in the House of Commons on November 30 by Mr. Richard Wood, Minister of Power. He was answering a member who wanted to know when the committee would make its report. The Minister said it would be some months before it was ready.

The Committee on Coal Derivatives was set up on April 16 under the chairmanship of Mr. A. H. Wilson, F.R.S., deputy chairman of Courtaulds. It has representatives of the oil, chemical and gas industries.

Memoranda should be sent to the Secretary, W. R. G. Bell at the Ministry of Power, Millbank, London, S.W.1.

New premises and extensions

British Drug Houses Ltd. plan to build a warehouse and despatch depot at their premises in Graham Terrace, Islington, London, N.1.

Max Factor Ltd. have had plans prepared for the proposed erection of an extension to their factory at Francis Avenue, Bournemouth, Hampshire.

Middleton and Co. Ltd., manufacturing chemists, 90 Boundary Road, Middlesbrough, have had plans approved for the early erection of showroom, warehouse and office premises on a site at Cannon St., Middlesbrough, Yorks.

More titanium oxide

Laporte Industries Ltd. announce that extensions are to be made to the Stallingborough (Lincs.) works of Laporte Titanium Ltd., to increase the production capacity of the titanium oxide plant from 30,000 tons to 50,000 tons a year over a period of three years.

The cost of these extensions will be of the order of £3·5 m. and it is anticipated that the whole of this amount will be financed out of Group resources.

Although it is expected that it will take three years before the total of 50,000 tons production capacity is reached, increases in production will take place at intervals during the construction period.

Tax exemptions

A notice by the Commissioners of Custom and Excise, No. 78B, gives detailed information as to the scope of the tax on drugs and medicines and the statutory exemptions. It supersedes Notice No. 78B (June 1955), and all amendments and additions issued up to May 31, 1959.

People

Dr. F. E. King, F.R.S. has joined the refineries and technical department of The British Petroleum Co. Ltd. as scientific adviser. He was formerly a director of British Celanese Ltd.

S. H. W. Pert has resigned from the board of Bowmans Chemicals Ltd. He had been managing director for the past 30 years. **M. H. M. Arnold,** who joined the company as technical director last year, succeeds him as managing director.

L. E. Whitmore has been appointed director and general manager of the polyethylene division of Union Carbide Ltd. He will be responsible for marketing and manufacture. **J. F. Widman,** previously director of chemicals marketing, has been appointed director and general manager of the chemicals division.

R. Wilon has been made a director of the company and director and general manager of the alloys division.

Dr. R. C. Swain, vice-president and a director of American Cyanamid Co. has been appointed director-general of Cyanamid International. **S. C. Moody,** former Cyanamid International director-general, will continue as staff vice-president for international relations.

Dr. R. O. Roblin, former general manager of the commercial development division, has been appointed a vice-president and will assume Dr. Swain's staff responsibilities in the supervision of research. He will also direct commercial development, engineering and construction.

H. P. Forder and **A. R. Hay** have been appointed directors of the United Steel Co. Ltd.

Mr. Forder is director and general manager of the Samuel Fox and Co. Ltd. subsidiary of the company. He joined the company in 1930 as an apprentice.

Mr. Hay is a director of Naylor, Benzon and Co. Ltd., who represent United Steels in the Newcastle area.

Miss Violet Brewer, the daughter of His Excellency George T. Brewer Jr., Liberian Ambassador to the United Kingdom, has commenced a course of training in the laboratories and workshops of Evans Medical Ltd. In 1957 Evans Medical concluded an agreement with Liberia whereby the company was appointed sole suppliers or purchasing agents of all pharmaceutical products and medical equipment required by the government, including its requirements for the Liberian National Public Health Service. Under this agreement the company agreed to train three Liberian nationals in the practical aspects of pharmacy and chemistry to enable them to take up positions in the Government Medical Stores.

Newton Chambers and Co. Ltd. have made new appointments in the sales side of their Chemicals Division. From January 1, **J. A. Burckhardt,** at present assistant advertising manager, will become assistant trade sales manager to **F. R. James,** trade sales manager. **F. Etchells** will relinquish his post as field assistant consumer sales manager, Northern Area, to become assistant consumer sales manager to **V. A. J. Wagstaff,** consumer sales manager. **G. H. A. Hewes** (trade sales representative Surrey), has replaced **M. W. Walton,** who has left the company, as an assistant sales manager, trade sales department. **A. E. Freer** (trade sales representative, Cheshire) will become an assistant sales manager in the trade sales department on January 1. In the consumer sales department, **R. J. MacRae** will take over as field assistant sales manager, Midlands Area, and **W. H. E. Nelson,** the present field assistant sales manager in the Midlands, will take charge of the northern consumer sales area.

Heat transfer medium

A heat transfer medium, *Thermex* has been added to the range of phenol derivatives made by the Heavy Organic Chemicals Division of I.C.I. It is a eutectic mixture of diphenyl oxide and diphenyl in the respective proportions by weight of 73·5% and 26·5%. It is said to be the first heat transfer medium of this type to be manufactured commercially in Britain.

The product has a boiling point of 255°C. and a freezing point of 12°C., and good thermal stability over long periods at temperatures up to 400°C. According to I.C.I. it has high heat transfer coefficients, particularly in the vapour phase; further, it is non-corrosive and presents a negligible fire risk.

Changes of name

It is announced by Birlec Ltd. that, with effect from January 1, the company name will be changed to A.E.I.-Birlec Ltd.

The change coincides with the final reorganisation of the structure of the parent company, Associated Electrical Industries Ltd., into several product divisions.

On January 1 Sunvic Controls Ltd. will combine with the Instrument and Meter, Scientific Apparatus and X-Ray Departments of Metropolitan-Vickers Electrical Co. Ltd. to form the Instrumentation Division of Associated Electrical Industries Ltd.

Technical Press Review—December

Corrosion Technology. — Performance of Aluminium in Refineries; Metallic Lead Priming Paints for Marine Usage; Stainless Steel and Related Alloys versus Marine Environments.

Chemical and Process Engineering.—Electric Surface Heating for Hazardous Areas; Economical Electricity Generation in a Pharmaceutical Factory; Electric Furnaces in Chemical Manufacture; Size Reduction; "Hypo" from By-product Sulphite; Utilities and Services in the Chemical Industry; Swedish Heavy Water Process; Ceramics and Cermets for Nuclear Fuels; Application of Large Radiation Sources in Industry.

Automation Progress. — The Design of Automatic Test Equipment for Small Electrical Components; Transfer Machine Balance Rotors; Designing Computers for Reliability; Transfer Machining of Graphite for Nuclear Piles; The State of Automation in Poland.

Petroleum. — Oilfield Development—3; Current Review of Petroleum Asphalt; Petrochemicals from Belayim Coking Unit—2; Additives for Hydraulic Oils; Tranmere Oil Terminal.

Paint Manufacture.—Guide to Resins Supplement; Glycerol Alkyds Have Many Uses; Condensation Polymers.

Food Manufacture.—Review of Equipment for Smoking and Curing Meat; The Curing of Meat.

Fibres and Plastics.—Vinyl Processing Machinery; Resnit—An Important Development in Reinforced Plastics; Gel Coats on Reinforced Plastics; Surface Treatment for Glass Fibres; Resins for Reinforced Plastics; Spraying Process for Synthetic Resins; The Production of Reinforced Plastics; Moulding a Glass Fibre Boat; Glass Fibres for Reinforced Plastics.

Dairy Engineering.—The Outlook for Milk and Milk Products; Yugoslavia's Milk Powder Industry; A Co-operative Butter Venture in Denmark; The Microscope for Dairy Chemist—2; Labour-saving Method of Making Cheddar Cheese.

World Crops.—Coffee in India; Paint in Tropical Climates; Weed Control in Sugar Cane; Crop Protection by Seed Treatment—2; The Machine in Tropical Agriculture—4.

For specimen copies and subscription forms apply to the Circulation Manager, Leonard Hill House, Eden Street, London, N.W.1.

Petrochemicals—new plant will make 45m. lb. p.a.

Part of the product storage area, drumming and despatch building at the new Union Carbide petrochemicals plant at Hythe, Hampshire.

Union Carbide is pressing to rapid completion its new petrochemicals plant at Hythe, near Southampton. Ethylene supplied by Esso's adjacent refinery will be converted into ethylene oxide derivatives, to provide about 45 million lb. of petrochemicals p.a. Installations include units for the production of ethylene oxide, ethylene glycols, polyethylene glycols, ethanolamines, glycol-ethers and specialised products including polyglycol ethers, polyglycol esters, and other surface active agents.

Some of the principal applications for the products include: antifreeze, transparent paper, textile auxiliaries, printing inks, pharmaceuticals, cosmetics, detergents, agricultural chemicals, and as solvents in the surface coatings industry, heavy duty brake fluids, rubber mould lubricants and petroleum refining. The specialised chemicals plant installed will allow a high degree of automation.

The Hythe plant is the second major petrochemicals producing plant of Union Carbide in the United Kingdom. The polyethylene plant at Grangemouth has been operating for about two years and it was recently announced that capacity was being doubled.

Effect of drugs on life assurance

More people who have been treated with new antibiotics for certain diseases are becoming eligible for life assurance. This was the theme of a talk entitled "Progress in medical science and its influence on the underwriting of impaired lives" given by Dr. T. W. Preston, principal medical officer, Prudential Assurance Co. Ltd., to the Insurance Institute of London on November 30.

Many cases of chronic pulmonary tuberculosis which 20 years ago would have been rapidly fatal, now responded well to antibiotics, he said. Cases of tuberculosis of organs other than the lungs which used to be treated by surgery, now also responded to antibiotics, and were safe for life assurance after a few years.

He quoted figures to show that between 1947 and 1957 a large series of pulmonary tuberculosis cases had been accepted for life assurance. The mortality rate was satisfactory and well within expected limits.

Dr. Preston said that great advances had been made in the study of the blood and there were several types of anaemia, formerly of ominous portent, which responded well to modern treatment and were acceptable for life assurance.

"Pneumonia, meningitis, various forms of septicaemia, formerly grave and often fatal maladies, are now readily brought under control, and persons who have suffered from them are usually acceptable at first class rates of premium after recovery. Osteo-myelitis, a deep bone infection, before the era of antibiotics often assumed a chronic form, making the patient a poor risk for assurance. Now most casse respond to penicillin immediately. In more persistent cases, surgery may still be required, but under the 'umbrella' of antibiotics, success is the rule, and the risk to life small."

Dr. Preston said that in some directions progress had been less encouraging.

"Most assurance companies still show some conservatism in the acceptance of cases of gastric and duodenal ulcer in spite of claims made by surgeons that modern treatment can bring about complete cure. Experience in my own company, although not yet statistically significant, does not encourage a more liberal outlook."

On cancer, he said: "In spite of great advances in radiotherapy and in surgery, cancer still remains largely an unresolved problem. Broadly speaking, cancer subjects cannot be accepted for life assurance."

Company finance

An interim dividend for the year ending December 31, 1959, of 2½d. per 5s. ordinary unit has been declared by **Evans Medical Ltd.** It is expected that the final dividend will be at the rate of 3½d.

Net profit of **Glaxo Laboratories Ltd.** and subsidiary companies for the year ended June 30, 1959, was £3,017,796 (£2,610,566). A final dividend of 8½% less tax will be paid, making a total for the year of 14%.

Net profit of the **Beecham Group Ltd.** for the half-year ended September 30, 1959, was £1,933,000 (£1,635,000).

Profit after tax for the year ended June 30, 1959, for **Thomas Hedley and Co. Ltd.,** was £1,837,000 (£1,524,000).

Griffiths Hughes Proprietaries Ltd. The half-yearly dividend on the 5½% Cumulative Preference Stock will be paid on December 31. An Interim Dividend on the Ordinary Stock of 4% actual, less tax, on account of the year ending March 31, 1960, is also payable on December 31.

Unilever Ltd. and **Unilever N.V.** have declared interim dividends on their respective ordinary capitals (as increased by the one for four scrip issues made in December 1958) for the year ending December 31, 1959, at the following rates:

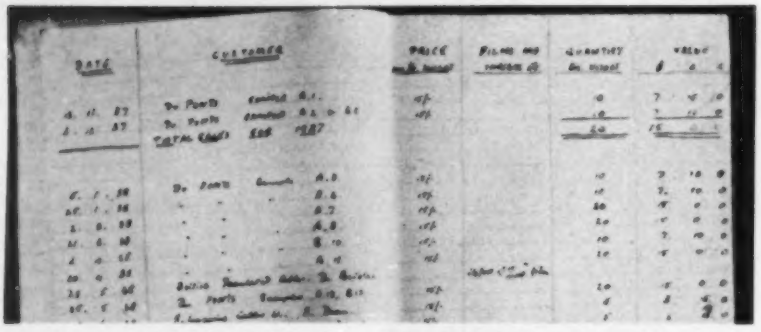
Unilever Ltd., a dividend of 1s. 7·2d. actual per £1 of stock before tax; Unilever N.V., a dividend of 7% actual, the equivalent of the Unilever Ltd. dividend calculated in accordance with the equalisation Agreement between the two companies.

The interim dividends for 1958, which were paid on the ordinary capitals before being increased by the scrip issues referred to above, were:

Unilever Limited, two interim dividends of 1s. 4·8d. and 8·4d. per £1 of stock before tax, and Unilever N.V., two interim dividends of 6¼% and 3%.

Gallenkamp buy Towers

A. Gallenkamp and Co. Ltd., London, E.C.2, scientific instrument makers and laboratory furnishers, have completed their purchase of J. W. Towers and Co. Ltd.



BIRTH OF AN INDUSTRY. " Total sales for 1937—20 lb."

The first recorded sales of polythene in the world were noted by a young I.C.I. research chemist. Part of his notebook, which came to light recently among old research files, is shown in the photograph. The chemist—Mr. E. G. Williams, one of the I.C.I. Alkali Division team to discover polythene —is now joint managing director of I.C.I. Plastics Division.

In 1937 polythene cost 15s. per lb., nearly 60s. in today's values. Current price is between 2s. 7d. and 3s. 2d. per lb. Total world sales of polythene are expected to be around 700,000 tons this year, of which about 90% will be made by the original high-pressure process.

Benzole hydrorefining plant

Port Talbot Chemical Co. Ltd., formed jointly by the Steel Co. of Wales Ltd. and Lincolnshire Chemical Co. Ltd., have placed contracts for the first hydrorefining plant in Great Britain to refine coke oven crude benzole to pure benzene. The plant is designed to treat 4·5 million gal. of crude p.a. and provision has been made for doubling capacity The plant uses coke oven gas as the source of hydrogen. The hydrorefining plant itself is being supplied by Lurgi of Frankfurt, Germany, with Simon-Carves Ltd. responsible for erection, the procurement of English supply equipment, and the installation of electrical equipment and instrumentation.

Hydrorefining of crude benzole has become almost standard practice in Germany, Japan and many Continental countries where low sulphur benzene is in demand, and the unit will be capable of meeting the increasing demand for low sulphur benzene in this country. In addition the process overcomes the troublesome effluent problem and high physical losses associated with conventional acid refining.

The distillation equipment incorporating the Montz plate has been designed in conjunction with Messrs. R. and J. Dempster Ltd., to produce maximum yields of 5·35 crystallising point pure benzene on a continuous unit. Low sulphur nitration toluene, xylene, and special high flash naphtha, with improved acid wash test and colour stability, will be produced in a vacuum batch column and still.

The works will be within the Port Talbot works of the Steel Co. of Wales, whose coke ovens will supply the crude benzole and coke oven gas. The installation will be complete with the necessary storage and ancillary plant and an administration and laboratory block will make the works fully self-contained.

The plant is programmed to start up towards the end of 1960.

FBI committee changes

Important changes in the permanent committee structure of the Federation of British Industries have been approved by the FBI's grand council. They have now come into effect.

1. A committee under the chairmanship of Sir Leslie Rowan, finance director of Vickers Ltd., will study, from the point of view of British industry, problems of policy towards under-developed countries.

2. An export promotion policy committee will advise the FBI on all aspects of export promotion and on the direction, method and timing of special activities. It will meet under the chairmanship of Sir Leslie Gamage, M.C., chairman of GEC.

3. An overseas credit and investment committee will study all aspects of overseas investment, credit and finance, which may affect the interests of industry. It will meet under the chairmanship of Sir Henry Wilson Smith. This permanent committee replaces the FBI panel on overseas credit and investment which was set up earlier this year to make recommendations on export credit facilities to the Chancellor of the Exchequer and the Exports Credit Guarantee Department.

4. Terms of reference of the existing FBI location of industry committee have been revised. This committee, set up to watch the interests of industry in matters arising from town and country planning, is paying particular attention to Government activity in connection with location of industry, with special reference to the Local Employment Bill. Mr. P. A. McRory is chairman of this committee.

Leonard Hill to Visit Kenya

Mr. W. Leonard Hill, Chairman of Leonard Hill Limited, publishers of MANUFACTURING CHEMIST will be visiting Kenya in January and February. He will arrive in Nairobi on January 14 and will stay for four to six weeks. It is his intention to study agricultural and industrial affairs in Kenya and he will be pleased to meet Kenya readers of Leonard Hill journals.

He can be reached through Group Captain C. G. Briggs in Nairobi or Poste Restante, G.P.O., Nairobi.

Scientific manpower survey

The main shortages in highly-trained scientific and technical manpower in the U.K. are chemists, physicists, metallurgists and chemical, mechanical and, to a lesser extent, electrical engineers, says a Unesco review of world-wide measures to increase the number of scientists, technologists and technicians (" Training of Technical and Scientific Staff "; H.M.S.O., 16s. 9d.) published last month.

The survey was prepared for the 1959 Conference of the International Bureau of Education and covers 55 countries. A need to increase technical and scientific staff and, therefore, to increase the number and capacity of establishments offering education in these fields was found to be a universal problem.

The U.K. reported encouraging progress towards achieving the national targets for the output of scientists, technologists and technical staff in the later 1960's. At the professional level, the twin sources of supply are the universities, with greatly expanded scientific and technological facilities, and technical colleges through the rapid development of new advanced courses made possible as new buildings come into use with the fulfilment of the 1956-61 £85 million building programme for technical education. From negligible numbers in 1950, it was estimated that in the session 1958-1959 7,000 to 8,000 students were enrolled in over 250 sandwich courses. The large majority of sandwich students in England and Wales are " works based," which means that they receive wages for the whole year, although they spend half their time in college and the rest in industry.

Reporting on new diplomas introduced to meet the needs of developing technology, the U.K. recorded the award for the first time in 1958 of the Diploma in Technology and the fact that numbers taking it would rise rapidly over the next few years. The National Council for Technological Awards, appointed by the Minister of Education in 1956, award the Diploma in Technology on a level similar to that of university honours degrees.

News from Abroad

HOLLAND

Congress on cosmetology

The 14th International Congress of Beauty Care and Cosmetology, organised by the Algemene Nederlandse Bond van Schoonheidsinstituten, will be held in Amsterdam from September 5-9, 1960.

Registration forms and further details can be obtained from the organising committee, c/o Anbos, P.O. Box 5017, Amsterdam - Zuid. Completed forms should be returned by January 15.

SWITZERLAND

New pharmaceutical firm

A new company, Kingshill Pharmaceuticals Inc., with headquarters at Rütistrasse 63, Zurich, has been formed to market newly developed ethical products in Switzerland and Germany. The company hopes to become the clearing house for European-American licensing agreements, and also offers consultant services to firms wishing to enter Continental markets.

The president of the new company is Dr. William Konigsberger, who has served as associate medical director with both Squibb and Pfizer in America. He directed the European research division of Searle from 1954 to June of this year.

NEW ZEALAND

Ambergris substitute

Manufacture of a substitute for ambergris, manool, which is extracted from native trees, is expected to start this year. The substance is worth approximately £10 per lb.

Surveys by the New Zealand Forest Service have shown that there are in Westland sufficient *Dacrydium biforme*, one of the native trees containing manool, to provide 20 tons p.a. of the product for 25 years.

Cheaper HCl

A new method for the production of hydrochloric acid involves the passing of a common salt solution through an ion exchange resin. Hydrochloric acid is given off as an effluent. When the resin is exhausted it can be regenerated with sulphuric acid. The process has been developed by the N.Z. Department of Scientific and Industrial Research.

SOUTH AFRICA

Weedkillers and preservatives

The recent issue of £750,000 5¾% guaranteed debenture stock by Klipfontein Organic Products Ltd. was fully subscribed. The funds were raised mainly to finance the corporation's plans to extend its activities to provide for the production of a range of herbicides and timber preservatives not at present made in South Africa. Up to now these items have been imported. It is estimated that when the corporation is producing these items in the required quantities it will be possible for South Africa to save up to £250,000 in foreign exchange annually. It should also be possible to export many of the items in the new range of light chemicals to neighbouring territories.

Surgical dressings factory

The first surgical dressings factory in South Africa, to be completed by the middle of 1961, is planned by Smith and Nephew Ltd. The plant will be set up in Pinetown, a new manufacturing centre 15 miles inland from Durban.

Primary raw materials used will be mainly South African, which should mean a considerable expansion in the South African pharmaceutical industry.

The managing director of Smith and Nephew's South African branch is Mr. H. S. Dagger and the chemical manager is Mr. S. Mitchell. The latest methods of sterilisation will be employed at the Pinetown factory.

UNITED STATES

Colgate-Palmolive expansion

The Colgate - Palmolive Co. has embarked on a major construction programme for the Toilet Articles Division at its Jeffersonville, Indiana, plant to speed up service for Mid-western and Southern customers.

The project, which will cost more than $1 million, includes a 4-storey addition to the present toilet articles manufacturing building, a 2-storey addition to the packaging and shipping centre, and a new 2-storey warehouse for supplies and finished products. A 1-storey office building will be erected in the same plant area.

The new warehouse will cover 60,000 sq. ft. and the two additions will occupy 25,000 sq. ft. Construction has already started, and the project is expected to be completed by May next year.

The warehouse and additions will be made of reinforced concrete with steel used to support the upper floors. The structures will be sheathed with speed-wall tile to match the cream-coloured exteriors of existing buildings.

Designed for rapid order processing and handling, the new warehouse will have special elevators to carry pallets of goods from floor to floor. It will also centralise all storage operations close to the shipping facilities.

All toilet articles manufacturing, office, warehousing, and shipping operations will be concentrated in one section of the Jeffersonville plant upon completion of the expansion programme.

AUSTRALIA

Gas analyser

A new analytical device has been developed by chemists of Imperial Chemical Industries of Australia and New Zealand Ltd., and is being used at the company's plastics factory at Botany, New South Wales, to analyse the ethylene gas from which polythene is made. A more advanced machine is being developed.

Called a flame ionisation detector, the device can measure impurities in the order of less than 1 p.p.m. as it analyses the exact composition of gases. It is part of a standard gas chromatograph. The advanced model will detect and record impurities automatically.

Sulphuric acid bounty

The Tariff Board is enquiring into the sulphuric acid bounty, as the Federal Government feels that its earlier policy of encouraging the use of indigenous pyrites and lead and zinc concentrates for acid production, in place of brimstone, is no longer economic. But it is reluctant to abandon its responsibilities to the industry, which has reportedly spent about £8 million on pyrites plant. It wishes the Tariff Board to recommend a bounty which, while not designed to encourage further conversion (as the present bounty is), will honour the Government's obligations to firms which co-operated during the brimstone shortage.

New insulin tablets?

A Western Australian nun, Sister Philomena Earle, of St. John of God Hospital, Subiaco, claims to have found an effective way of administering insulin orally, having developed insulin tablets about the size of a match head. She has a science degree, is a trained nurse, laboratory technician and dietician. "After years of research, involving exhaustive laboratory work," she says, "and with wonderful help from my superiors and sisters, I developed these tablets. I intend to present a paper on this subject shortly."

Soap production

Latest official statistics reveal that at June 30 there were 90 soap and candle factories in operation in Australia, employees numbering 2,983 with an annual salary and wage bill of £2,803,000. Value of land and buildings was £1,871,000, while plant and machinery was worth £2,973,000. Raw materials used in the year were worth £14,446,000, while total value of output was £25,412,000.

Production for 1958-59 included

398,798 cwt. toilet soaps; 690,180 cwt. household soaps; 155,871 cwt. industrial soaps; 62,920 cwt. abrasive cleansers or scourers; and detergents (including extracts and powders) totalling 679,403 cwt.

GHANA

I.C.I. insecticide factory

The first Imperial Chemicals Industries insecticide factory in West Africa was opened at Tema, Ghana, last month by Dr. Kwame Nkrumah. The plant has a capacity of 500,000 gal. of insecticide p.a. This will be sold under the trade mark of P.P. *Kumakate*, formulated ready for spraying. Use of the insecticide is said to have already led to increased cocoa crops.

The Ghana Government, which first called on the assistance of I.C.I. and its subsidiary, Plant Protection Ltd., in 1954, intends to spray some 2½ million acres of cocoa trees during the next 3 years. The operation will require a minimum of 700,000 gal. of the insecticide, will employ 14,000 people and will cost £12¼m.

In deciding to locate the new plant in Ghana, I.C.I. has followed its policy of developing local manufacture in the country of sale. By manufacturing in Ghana, transport and packaging costs are reduced, resulting in lower prices to the customer.

AFGHANISTAN

Tabletting plant

The Ali Abad Health Institutes have acquired a tablet-manufacturing laboratory capable of producing 21 types of tablets which are in greatest demand. The laboratory equipment was bought in West Germany, and cost Kabul University, to which the Ali Abad Health Institutes belong, nearly $4,500.

Among the tablets manufactured are: Polivit (composed of six vitamins), vitamin B_1, vitamin C, luminal, calcium vitamin C, antidiarrhœa tablets for children and adults, sodium bicarbonate, and vitamin B_6.

Other tablets now in process of manufacture include: sulphaguandine, sulphadiazine, anti-rheumatic tablets, scopolamine, santonin, strychnine and ferrous sulphate.

Production has considerably reduced import costs. Dr. Kiramuddin, director of the Ali Abad Health Institutes, said that cost of the tablets is a sixth of import costs. Basic chemicals used are imported. He added that for the moment all the products of the laboratory are used by the university hospitals.

The Ali Abad Health Institutes already have a fully equipped ampoule-making plant. This saves about 1 million Afghanis (about £17,545) by reducing imports of various ampoules from abroad. In the next few months the Health Institutes plan to import another plant for the manufacture of ointments for eye and skin diseases.

New Products

Fixer stain remover

A photographic fixer stain remover, *Silm*, is available from May and Baker Ltd. It is stated to be safe to use on all kinds of materials, both white and coloured, and to be effective even on old stains.

The remover is available in 4 oz. polythene squeeze bottles. These are fitted with a polythene screw cap with a spray nozzle closed by a cap attached to the bottle by a flexible retaining arm.

For Parkinsonism

Akineton, 3 - piperidine - 1 - phenyl - bicycloheptenyl - propanol - (1), is stated to ameliorate the Parkinson syndrome, giving increased motor coordination and reducing rigidity, excessive salivation and sweating. It is available as tablets containing 2 mg. of the hydrochloride and as an isotonic solution containing 5 mg. of the lactate per mil. Dosage is 1 mg. twice daily initially, gradually increasing to 2 mg. three times a day.

Pruritus treatment

Soventol is said to be an effective histamine antagonist capable of suppressing anaphylactic reactions, and an antispasmodic and antipruritic with a central sedative action. Suggested applications are the treatment of superficial dermatoses, serum sickness, motion sickness and post-operative vomiting.

The product is available in tablets of 50 mg., the usual effective dose, as a jelly containing 2% of the lactate, and as *Soventol C* in dragees. Each dragee contains 25 mg. of the hydrochloride supplemented by 20 mg. of β-cyclohexylisopropyl methylamine hydrochloride, a mild central stimulant stated to prevent fatigue which may follow the administration of *Soventol* alone. It does not affect the antipruritic action and tends to intensify histamine antagonism.

Nasal-carrier cream

I.C.I., Pharmaceuticals Division, have introduced *Naseptin* nasal-carrier cream. This new antibacterial cream is specially formulated to deal with nasal carriage and contains *Hibitane* hydrochloride and neomycin sulphate in a water-miscible cream base.

Naseptin is recommended for the treatment of staphylococcal infections in general practice. At least 85% of patients with recurrent boils and styes carry the causative staphylococcus in the anterior nares. Treatment of the anterior nares greatly reduces the number of recurrences of infection. Carriers of pathogenic strains of staphylococci in hospitals, both patients and staff, also require treatment with *Naseptin*. It may be used for the prophylactic treatment of new-born infants to reduce the sources of staphylococcal output which are responsible for breast abscesses in mothers. This combination of *Hibitane* and neomycin has been widely used and its advantages have been demonstrated. It does not lead to any sensitivity reactions and organisms do not become resistant, it is claimed.

The cream is issued in 5 g. tubes packed in single cartons, retail price 3s. 6d. each plus 7d. purchase tax.

Denture cleaner in applicator bottle

A new method of cleaning dentures provides a complete cleaning outfit in one bottle.

The idea began in 1945 when a dental surgeon formulated a new cleaning liquid for dentures. Called *Denclen*, it was manufactured by Krauth Chemicals of Weybridge, Surrey. It dispensed with the old method of soaking teeth overnight, as cleaning took only a matter of seconds. But there was one snag. It was inconvenient to use as it had to be applied with cotton-wool held in tweezers.

Now it is packed in a polythene bottle with a built-on brush. The liquid is squeezed from the bottle by direct feed on to the brush, and the dentures can be cleaned immediately. The new pack sells at 2s. 8d.

Broad-spectrum antibiotic

Cyanamid International have developed a broad-spectrum antibiotic said to be significantly more potent than tetracycline and active against more bacterial strains.

The drug, *Ledermycin* dimethyl-chlortetracycline (DMCT), was the subject of reports by 13 medical investigators at the Seventh Annual Symposium on Antibiotics held in Washington, D.C., in November.

The product is a naturally occurring antibiotic, produced by an offspring of the organism from which aureomycin was isolated in 1946. It is now available to physicians in the U.S.A. (where it is trademarked *Declomycin*) and arrangements are in hand for the antibiotic to be made available elsewhere.

At present DMCT is being produced at Cyanamid's Lederle Laboratories Division in Pearl River, New York, but it is expected that some of the overseas manufacturing plants of Cyanamid International will commence production during 1960.

Nasal decongestant

Otrivin, a nasal solution for the relief of "stuffy nose," has been introduced by Ciba Pharmaceutical Products Inc., New Jersey. A gentle nasal decongestant, it was developed especially for cold and hay fever sufferers sensitive to the burning sensation or stinging often associated with drugs of this type. The product, which is xylometazoline Ciba, a topical vaso-constrictor, is claimed to reduce swollen nasal mucous membranes quickly and gently.

NEW PATENTS

COMPLETE SPECIFICATIONS ACCEPTED

Antibiotics

Production of penicillin. *G. Anderson, L. J. Davis and V. F. Davey.* 826,482.

Fertilisers

Fertilisers. *A. James.* 824,844.

Phosphate fertilisers. *Iowa State College Research.* 826,234.

Trace element fertilisers. *W. Jost.* 825,612.

Vitamins

Process for recovering vitamin B_{12} factors (cobalamins). *W. Heyl.* 825,118.

Coated ascorbic acid. *El Merck A.G.* 826,307.

Vitamin E composition. *Eastman Kodak Co.* 824,912.

Steroids

Preparation of $\Delta^{1,4}$—steroids. *American Cyanamid Co.* 826,395.

$\Delta^{1,4}$ pregnadienes. *American Cyanamid Co.* 826,396.

Steroid compounds. *Merck and Co. Inc.* 826,365; 826,369.

Dehydro-compounds of the steroid series and process for their manufacture. *Ciba Ltd.* 825,210.

Steroid compounds and therapeutic compositions containing them. *Merck and Co. Inc.* 826,362.

Dyestuffs

Compositions comprising water-repellent alkylated monoazo dyes. *Midland Chemical Corp.* 825,857.

Copper containing disazo dyestuffs of the stilbene series. *J. R. Geigy A.G.* 825,431.

Cobalt complexes of 3-amino-4-hydroxybenzene sulphonylmorpholine monoazo dyestuffs. *H. G. C. Fairweather.* 825,066.

"*O, O*'-dihydroxy-monoazo dyestuffs containing pyrrolidenyl residues and their metal complex compounds. *A.G. Farbenfabriken Bayer.* 826,207.

Water-insoluble monoazo triazine dyestuffs and processes for their manufacture. *Imperial Chemical Industries Ltd.* 825,377.

Monoazo dyestuffs containing dichlorotriazinylamino groups. *Imperial Chemical Industries Ltd.* 826,405.

Vat dyestuffs of the anthraquinone series. *Badische Anilin- & Soda-Fabrik A.G.* 825,033.

Pharmaceuticals

Cyclopentanopolyhydro - phenanthrene compounds. *Merck and Co. Inc.* 826,366.

Therapeutically active compositions containing cysteine compounds. *Recherches et Propagande Scientifiques.* 825,178.

Phenothiazine derivatives and process for their preparation. *Upjohn Co.* 825,561.

Quinone compounds and process for their manufacture. *Ciba Ltd.* 825,558.

Manufacture of barbituric and thiobarbituric acids. *Abbott Laboratories.* 825,832.

Compound of the cyclopentanopolyhydrophenanthrene series, the preparation thereof, and therapeutic compositions containing said compound. *Organon Laboratories Ltd.* 826,028.

Hydroquinone compounds and process for their manufacture. *Ciba Ltd.* 825,760.

Preparation of sulphur-containing piperazine compounds. *C. Pfizer and Co.* 825,995.

Substituted phenoxy-propionic acid esters and compositions containing them. *Boots Pure Drug Co. Ltd.* 825,875.

These culture tubes moulded in British Resin Products' Rigidex high density polythene are said to have several advantages over ordinary glass tubes. They are unbreakable and can be steam sterilised without distortion, and they are also said to be resistant to most chemicals.

Production of monohydroxy aluminium di-acetylsalicylate. *Lewis-Howe Co.* 826,299.

Process for the production of dioxopyrazolidines. *J. R. Geigy A.G.* 825,058.

Cyclopentanopolyhydro - phenthrene compounds. *Merck and Co. Inc.* 826,364.

Quaternary ammonium compounds and the preparation thereof. *Wellcome Foundation Ltd.* 824,853.

Therapeutic derivatives of aryl-benzthiazoles. *Crookes Laboratories Ltd.* 825,016.

Sulphonamides. *T. J. Smith and Nephew.* 824,978.

Antibacterial cyanomitro vinyl-benzenes and thiophenes. *Lepetit S.p.A.* 825,241.

Retrocortin derivatives and their preparation. *Merck and Co. Inc.* 826,363.

Retrocortin esters and their preparation. *Merck and Co. Inc.* 826,360.

Hydroretrocortin and derivatives of hydroretrocortin. *Merck and Co. Inc.* 826,361.

Production of organotherapeutical preparations. *Rhein-Chemie G.m.b.H.* 825,012.

THE CHEMICAL MARKET

Publication of our list is temporarily suspended. Major price reductions have been made by Shell Chemical Co. Ltd. They have cut £10 per ton from the price of **ketone solvents,** namely methyl ethyl ketone, methyl isobutyl ketone, secondary butyl alcohol and methyl isobutyl carbinol. Reductions of up to £10 per ton have been announced for a number of chemicals. Most of Shell's **alkanolamines** and both grades of **monopropylene** glycol are affected. The cuts took effect on December 1.

NEW TRADE MARKS

APPLICATIONS

Cosmetics, toilet preparations

VINOLIA MODEL.—781,899. *Vinolia Co. Ltd.*

TEXENTINT.—782,230. *J. and E. Atkinson Ltd.*

DEDORAN.—782,694. *A. F. R. Peyron.*

LUVOS.—784,877. *Heilerde-Gesellschaft Luvos Just K.g.*

AJAX BRONZE TAN.—789,654. *Leslie Jack and Co.*

LAJK.—789,802. *Hans Ströbeck A.B.*

BANDBOX WASH-N-CURL.—790,360; BANDBOX WASH-N-SET.—790,361; BANDBOX WASH-N-STYLE.—790,362; BANDBOX WASH-N-WAVE.—790,363. *Ashe Laboratories Ltd.*

ZARIAN.—790,557. *M. E. Brown.*

ESMEERA.—791,135. *E. A. Spira.*

TOLARI.—791,650. *Ashe Laboratories Ltd.*

SILKY-BAC.—B786,701. *C. H. Boehringer Sohn.*

CALSON.—787,917. *N. Calverley.*

LAVICE.—789,953. *Chesebrough-Pond's Ltd.*

SOCOTIM.—790,578. *Soc. de Cooperation Technique et Industrielle.*

BEAUTY COUNSELOR.—B775,485. *Beauty Counselors of London Ltd.*

FELS.—784,848. *Fels and Co.*

NO-DRUFF.—790,808. *Twining Crosfield and Co. Ltd.*

MISLYN.—784,163. *I. M. Lechner American Laboratories.*

ASPRO.—756,428. *Aspro-Nicholas Ltd.*

RICHARD HUDNUT STYLE.—785,875. *Richard Hudnut Ltd.*

STENZONE.—789,676. *J. Grundy and Sons Ltd.*

BANDBOX.—B790,364. *Ashe Laboratories Ltd.*

STIMULIN.—790,668. *Chesebrough-Pond's Ltd.*

AUDACITY.—791,648. *J. C. and J. Field Ltd.*

TERN.—792,263. *M. Bertish and Co. Ltd.*

AUDACITY PRESS 'N SPRAY.—791,649. *J. C. and J. Field Ltd.*

SCORCH.—792,317. *Interscribe Ltd.*

Pharmaceuticals

ARAMINE.—783,898. *Merck and Co. Inc.*

FOSTEXA.—785,518. *Foster-Milburn Co.*

KENALOG.—785,561. *E. R. Squibb and Sons Ltd.*

PARGONYL.—787,457. *Les Laboratoires Français de Chimiotherapie S.A.*

ASCOXOL.—*A. B. Astra Apotekarnes Kemiska Fabriker.*

MULTISERPIN.—787,603. *Gebrüder Giulini G.mb.H.*

DINPOL.—788,547. *C. L. Bencard Ltd.*

MILKY WAY.—789,302. *Mars Ltd.*

MALAMITE.—790,210. *Murphy Chemical Co. Ltd.*

UNIJECT.—790,344. *Novo Industri A/S.*

ETILFARM.—790,484. *Soc. Farmaceutici Italia.*

RETROPAQUE.—790,961. *Bayer Products Ltd.*

DEKRASIL.—791,318. *Crookes Laboratories Ltd.*

MALAREX.—791,451. *A/S Dumex.*

BOTRO PASE.—763,094. *Instituto Pinheiros Productos Terapeuticos S/A.*

NUBEX.—776,192. *Anglo-French Pharmaceuticals Ltd.*

STREPSOL.—783,135. *Boots Pure Drug Co. Ltd.*

MEDIJEL.—785,959. *D.D.D. Co. Ltd.*

FABAHISTIN.—786,604. *Farbenfabriken Bayer A.G.*
TUSSOIDS.—788,178. *Boots Pure Drug Co. Ltd.*
PEPTINOL.—788,616. *Peptinol (G.B.) Ltd.*
"UREVERT."—788,847. *Travenol Laboratories Inc.*
CORTOCAPS.—789,115. *Crookes Laboratories Ltd.*
HYDRIL.—789,328. *Ward Casson Ltd.*
ANGIERON.—789,382. *Bristol Myers Co. Ltd.*
APACILLIN.—789,954. *C. L. Bencard Ltd.*
ASPRILLIN.—789,960. *Radiol Chemicals Ltd.*
BIJAMYCIN.—790,662; PANBRONIN.—790,664. *C. L. Bencard Ltd.*
ANGETTES.—790,708. *Bristol-Myers Co. Ltd.*
MEDRO-CORDEX.—790,929. *Upjohn of England Ltd.*
RIBENA.—791,066. *Beecham Foods Ltd.*
ALTAFUR.—791,391. *Norwich Pharmacal Co.*
EBIMAR-AL.—791,481. *Evans Medical Supplies Ltd.*
ORIMUNE.—791,623. *American Cyanamid Co.*
COLLOPRIN.—791,690. *Crookes Laboratories Ltd.*
TELBON.—792,151. *Ciba Ltd.*
FARMETAN.—792,245. *Union Chimique Beige S.A.*
AERETS.—792,033. *Wellcome Foundation Ltd.*
MIATRIL.—775,925. *Chas. Pfizer and Co. Inc.*
LIPOSERON.—780,272. *Foulds Research Laboratories Ltd.*
DEPINAR.—784,931. *Armour and Co.*
IONAMIN.—785,063. *R. J. Strasenburgh Co.*
SELARA.—788,142. *Bayer Productions Ltd.*
VI-QUINS.—B788,710. *International Import and Export Corp. Ltd.*
MALTESERS.—789,304. *Mars Ltd.*
CALIBRON.—789,850. *Commercial Drug and Chemical Co.*
ARLA-TABS.—789,494. *H. W. Woods (Pty.) Ltd.*
ARMOCINE.—790,775. *Armour and Co.*
NO-DRUFF.—790,804. *D.D.D. Co. Ltd.*
THERALAX.—791,877. *Beecham Research Laboratories Ltd.*
MEGS.—792,041. *Meggeson and Co. Ltd.*
FIBIONIL.—792,025. *J. R. Geigy S.A.*

NEW COMPANIES

These particulars of new companies have been extracted from the daily register of Jordan and Sons Ltd., company registration agents, Chancery Lane, London, W.C.2.

Deaminol Products Ltd. 23.10.59. 8 Southampton Row, London, W.C.1. To take over the distribution of the wholesale trade of *Deaminol* products. Wholesalers, dlrs. and mnfrs. of hair dyes, cosmetics, etc. £100. Dir.: A. Kanitz.

Caspar Chemical Co. Ltd. 26.10.59. 76 Albion St., Leeds 1. £100. Dir.: R. G. Caspar.

Howells and Harrison (Southend) Ltd. 26.10.59. 8 Earls Hall Parade, Southend-on-Sea, Essex. To take over bus. of chemists cd. on at Southend-on-Sea and Thorpe Bay, Essex, and at Bromley, Kent, as "Harrison and Howells," etc. £15,000. Dir.: C. P. Howells.

Saginex Ltd. 27.10.59. To acquire patents, licences, etc., relating to pharmaceuticals, drugs, medicinals, fine chemicals, etc. £100. Dir.: A. C. King. Sub.: A. J. Garner, Imperial Chemical Hse., Millbank, London, S.W.1.

R. H. Beardmore (Garston) Ltd. 28.10.59. 101 St. Mary's Rd., Garston, Liverpool 9. Chemists. £5,000. Dir.: R. H. Beardmore.

Delbrow Ltd. and Earlgar Ltd. 28.10.59. Chemists. £100 each. Sub.: T. A. Herbert, 156 Strand, London, W.C.2.

Chemaco Laboratories Ltd. 28.10.59. Research into chemical, physical and other properties of materials and to cy. on bus. of chemical engineers. £5,000. Sub.: M. T. Holmes, 1 Threadneedle St., London, E.C.2.

D. J. Rees Ltd. 28.10.59. 6 Crown Parade, Upminster Rd., Rainham, Essex. Chemists. £1,000. Dir.: D. Y. Sohn.

Litcarry Ltd. 28.10.59. Chemists. £100. Sub.: T. A. Herbert, 156 Strand, London, W.C.2.

G. S. Downie Ltd. 28.10.59. 11 New Rd., Mytholmroyd, Yorks. Chemists. £6,000. Dir.: Mrs. I. Downie.

Dachyl Ltd. 29.10.59. Mnfrs. of and dlrs. in detergents, soaps, etc. £100. Sub.: R. J. M. Howe, 22 Chancery Lane, London, W.C.2.

K. H. Turner Ltd. 29.10.59. 414 Bearwood Rd., Smethwick 41. To take over bus. of dispensing chemist, etc., cd. on as "K. H. Turner, M.P.S." at 3 Bell Lane, Tile Cross, Birmingham 33. £5,000. Dir.: W. L. Turner.

S. Allwright Ltd. 14.10.59. 593 High Rd., London, E.10. Wholesale chemists. £5,000. Dir.: S. A. Allwright.

Don Loper (England) Ltd. 14.10.59. 12A Grosvenor St., London, W.1. Mnfrs. of and dlrs. in soaps, perfumes and cosmetics. £100. Dir.: D. Loper.

J. W. Clowes Ltd. 15.10.59. 14 Ormskirk St., St. Helen's, Lancs. Chemists. £2,000. Dir.: J. W. Clowes.

L. A. Johnson Ltd. 15.10.59. 60 Park Rd., Wigan. Chemists. £7,000. Dir.: L. A. Johnson.

George Penman Ltd. 16.10.59. 1 Queens Rd., London, S.W.19. Chemists. £1,000. Dir.: G. Penman.

J. T. Roberts Chemists Ltd. 16.10.59. West Farm Ave., Longbenton, Newcastle upon Tyne. £1,000. Dir.: J. C. T. Roberts.

Ormond Pharmacy Ltd. 16.10.59. 2 Bentinck St., London, W.1. £1,000. Dir.: not named.

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N. and S. Furman Ltd. 19.10.59. 58 Stoney Lane, Houndsditch, London, E.C.3. Chemists' sundriesmen, etc. £1,000. Dir.: N. Furman.

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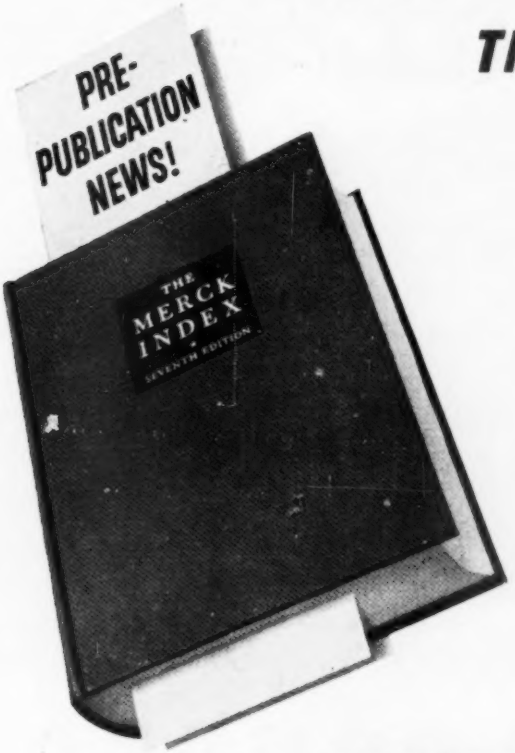

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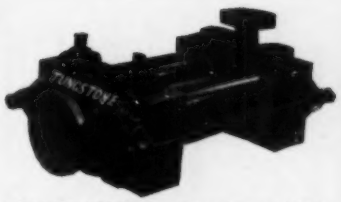

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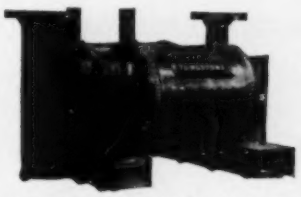

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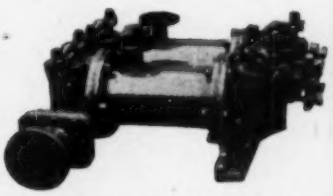

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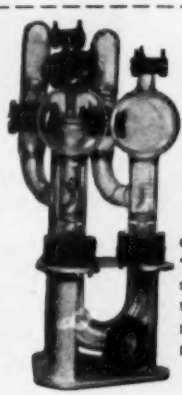

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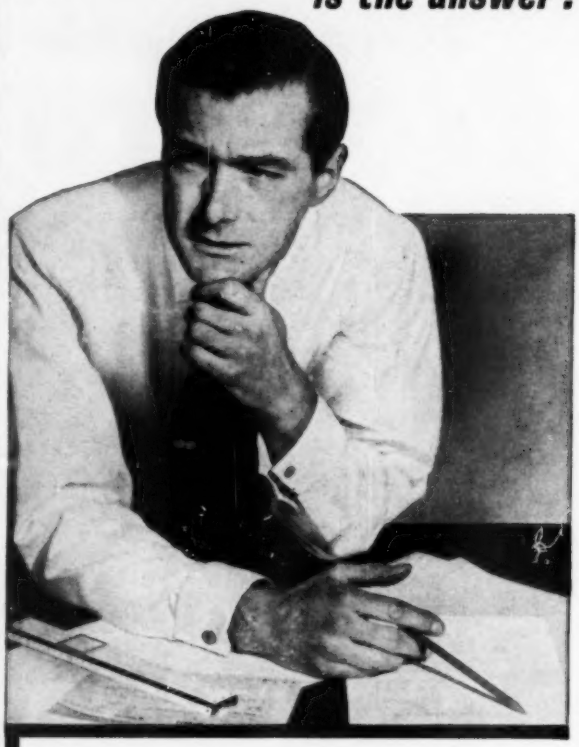

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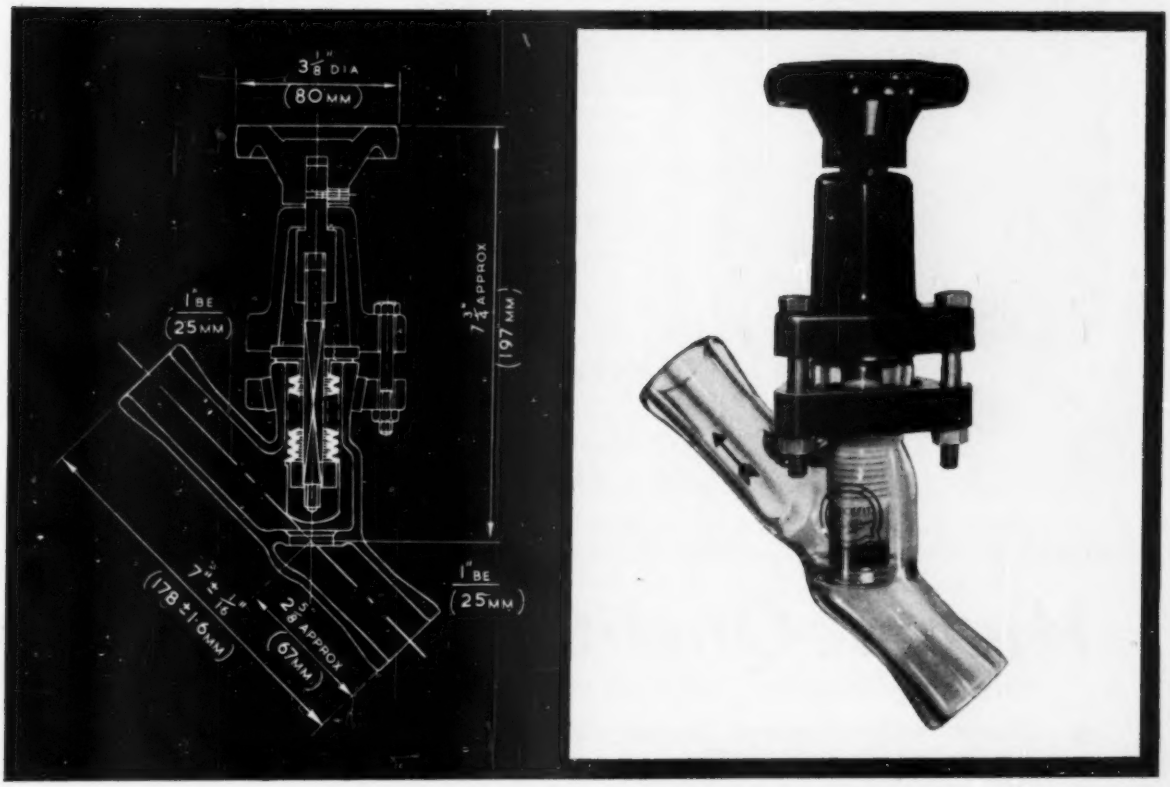

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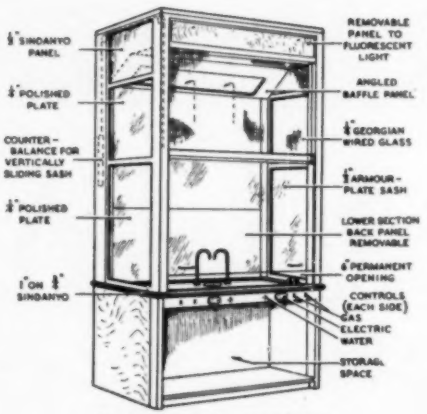

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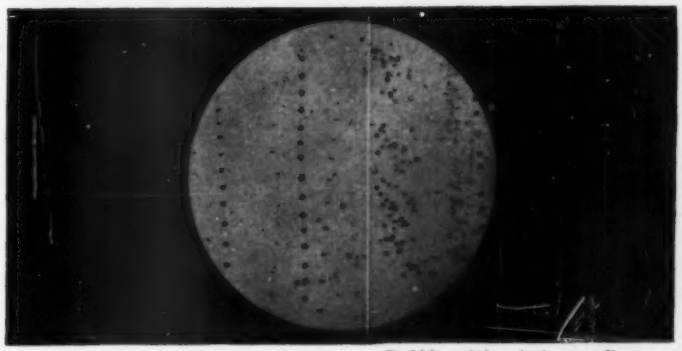

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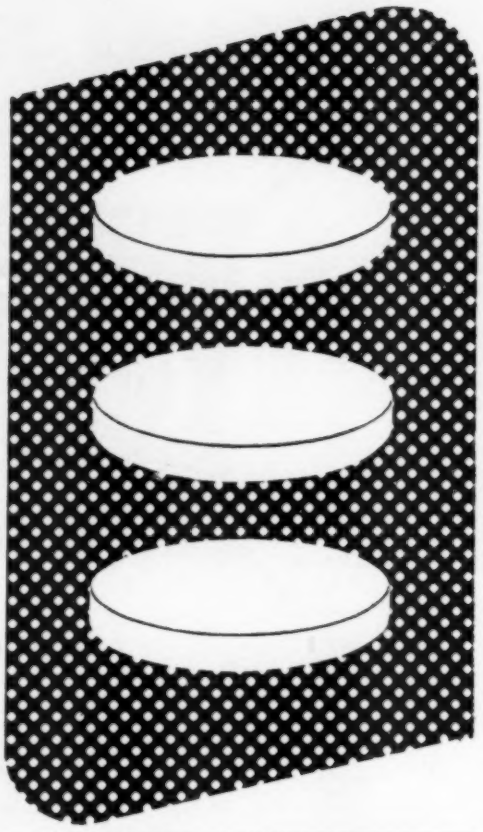

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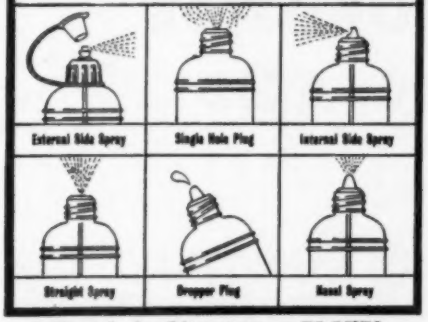

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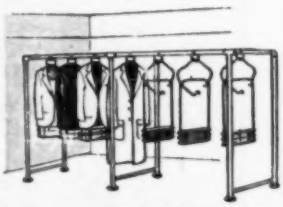

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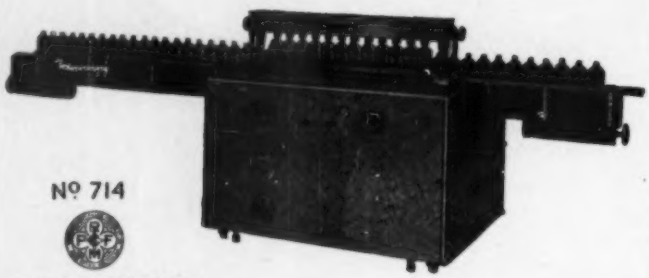

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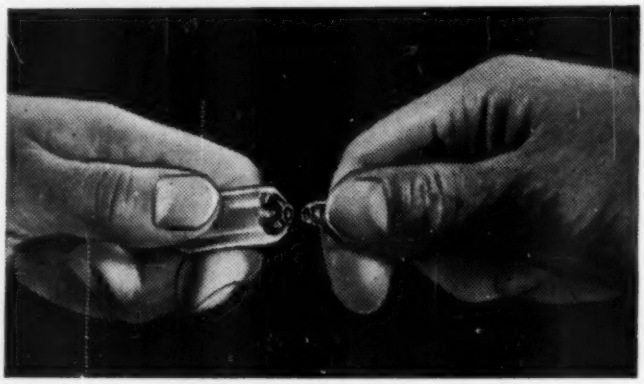

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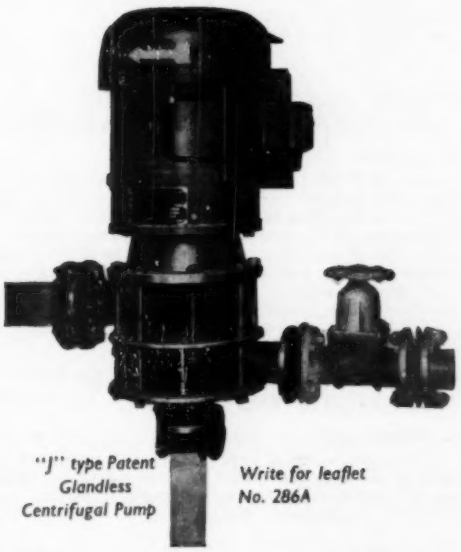

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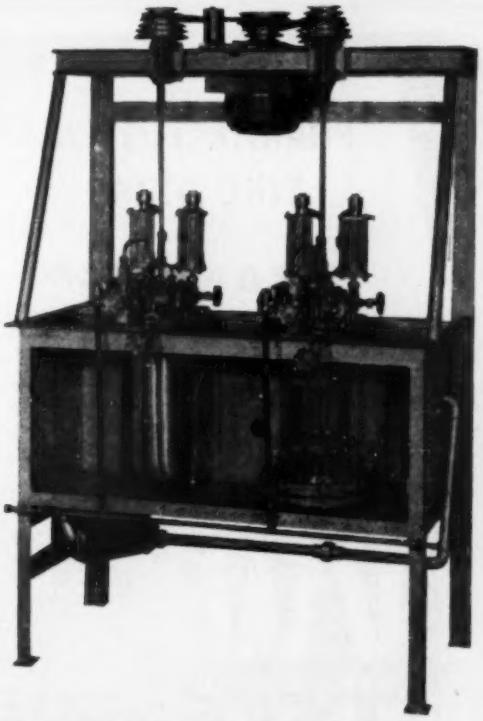

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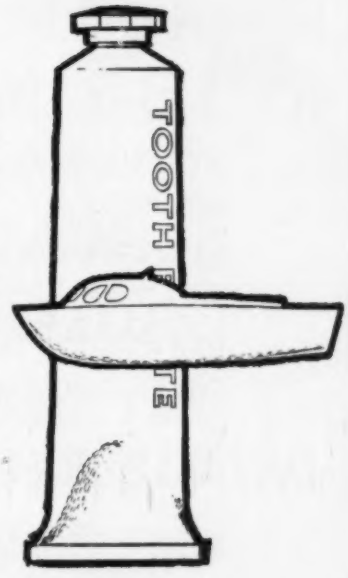

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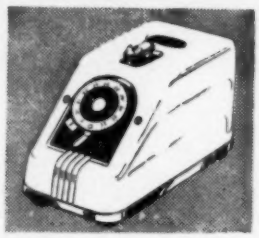

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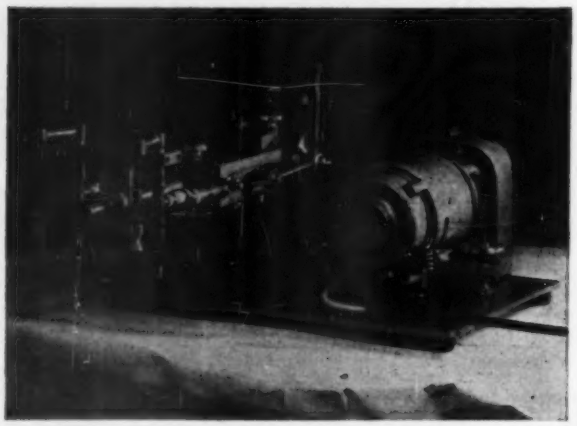

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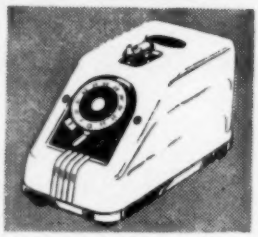

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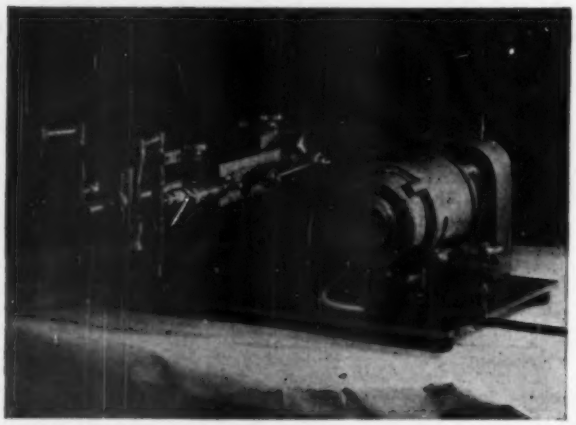

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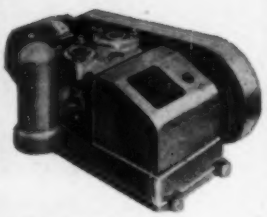

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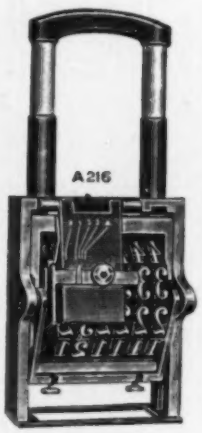

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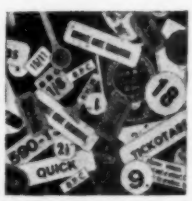

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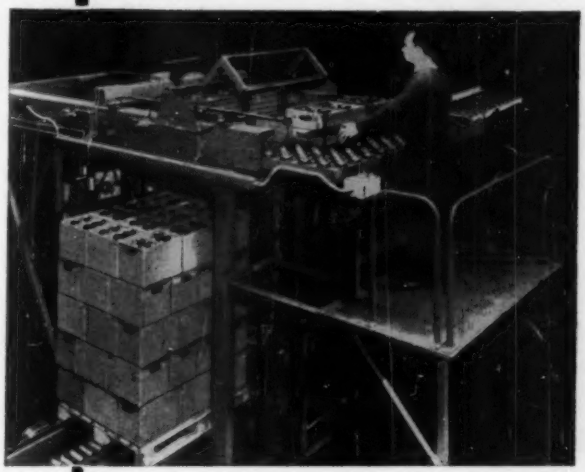

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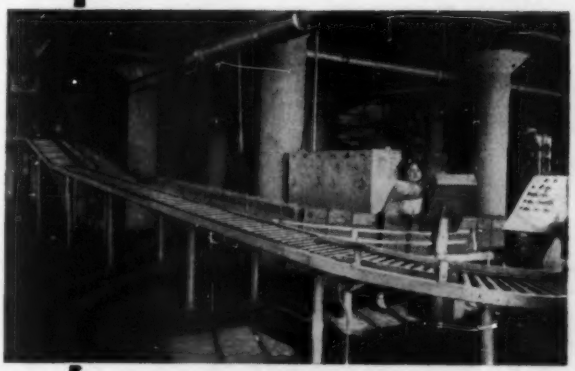

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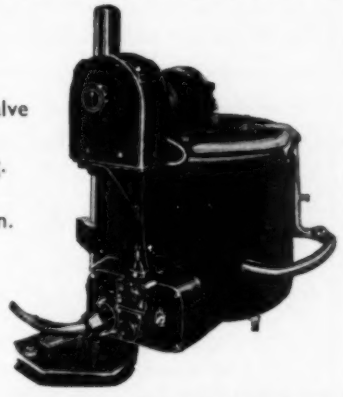

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Ref. A.130. British. Male. Single. Age 24. B.Sc. Mathematics and Physics. 2½ years aircraft industry, stressman, mathematician. Seeks appointment, possibly office, London. Salary £750 p.a.

Ref. A.131. British. Male. Age 37. Married. A.M.I.Mech.E. 3 years apprentice diesel engine manufacturers. 3½ years Assistant to Manager, general engineers. 1½ years Assistant engineer Consulting Engineers. 5 years Army. Knowledge contracts—electrical and production and aircraft industry. Seeks post Engineering Sales or Management. London or Provinces—would also consider abroad. Salary £1,200 p.a.

Ref. A.132. British. Male. Married. Age 31. O.N.C. Inorganic Chemistry, Elect.Ord.Grade Gas Engineering (Manufacture). 6 years pupil engineer Gas Company. 2 years Fuel Technician steel works. 2 years Technical and Chemistry Assistant Gas Board. At present operating and constructional engineer Retort House and Coke Oven Construction. Seeks post as Area Representative or Engineer S. or S.W. England. Salary £1,000 p.a.

Ref. A.133. British. Male. Married. Age 41. A.F.R.Ae.S. 2 years Technical Representative aircraft manufacturers. 8½ years Senior draughtsman aircraft manufacturers. 4½ years Liaison Engineer. 3½ years Project Engineer aircraft manufacturers. 1 year Senior Designer, astronautics. Seeks post Engineer or Technical Representative London, Surrey or America. Salary £1,200 p.a. minimum.

Ref. A.134. British. Male. Married. Age 22. Bakery Diploma. 16 months trainee manager, food manufacturers. 2 years practical experience bakers and confectioners. R.A.F. service as Pastry Cook. Has taken full course in Chemistry and interested in the Testing of Raw Materials. Seeks appointment as Test Baker or Bakery Chemist, anywhere, salary £753 p.a.

Ref. A.135. British Male. Age 47. Inter. B.Sc., Member of Inst. of Packaging. Experience: Asst. Packaging Manager for 5 years with manufacturing chemists, pharm. and vet. 4 years Dept. Manager, manufacture and packaging food manufacturers. 1 year Process Asst. Manager, Fuel Oil Co. 1 year Anal. chemist, food manufacturers. 3 years Prod. Manager, manufacture and packaging, food manufacturers. Considerable experience cordials, sauces, pickles, fish and meat pastes, individual wrap, containers, closures, seals. Now seeks Permanent Appointment Managerial/Executive/Development, London or Home Counties. Salary £1,000/£2,100 p.a.

Ref. A.136. Indian. Male. Resident U.K. B.Sc. (Chem.), M.S. (Bacteriology and Biochemistry). Age 38. Single. Experience: 1 year Research Assistant, Institute for Enzyme Research (U.S.A.). 6 months Bacteriologist food manufacturers. 7 years Scientific Officer food manufacturing research organisation. Seeks permanent appointment London area. Salary £1,000 p.a.

Ref. A.137. British. Male. Age 46. Part I B.Sc. (Eng.), Diploma in Mech. and Elect. Engineering. Experience includes 1 year Draughtsman/Checker. 1½ years Designer/Draughtsman. 1 year Designer/Draughtsman, Chemical Engineering. 3½ years Senior Draughtsman, Mechanical Engineering. Seeks post U.K. or Germany as Engineering Draughtsman. £850 p.a.

Ref. A.138. British. Male. Age 31. Married. B.Sc. Elec. Engg. Graduate I.E.E. 2½ years graduate apprentice and junior engineer Power Station. 1 year Technical Assistant transformer test department electrical engineers. 2 years Senior Engineer Research Department aircraft company. 3 years Asst. Electrical Engineer Manufacturing Company. Seeks post Bristol, S. or S.W. England, New Zealand or Australia as Electrical Engineer. Salary £1,200 p.a minimum.

Ref. A.139. British. Male. A.M.I.Mech.E., M.I.Plant.E. Age 35. Married. 2 years Air Engineer Officer, R.N. 3 years Technical Assistant prototype development. 6 years project engineer metal container manufacturer. 2 years Experimental officer atomic energy. At present Deputy Chief Trials Engineer missile manufacturer. Seeks post London area as Chief or Deputy Chief Engineer, Asst. Works Manager or Plant Engineer. Salary £1,450 p.a.

Ref. A.140. Polish. Resident U.K. Single. Age 26. B.Sc. (Eng.), Chem. Eng. London University. Just graduated. Speaks, reads and writes Polish and Russian, technical if necessary. Main interests: Curve Analysis and Logical Equipment Design. Seeks post as Junior Chemical Engineer Manchester or London areas. Salary £800/£850 p.a.

[Continued overleaf

To: I.S.I.S. Appointments Register, 9, Eden Street, London, N.W.1. Please ask the following applicants to communicate with the undersigned:

Ref.:_____	**Ref.:**_____	**Ref.:**_____	**Ref.:**_____
Ref.:_____	**Ref.:**_____	**Ref.:**_____	**Ref.:**_____
Ref.:_____	**Ref.:**_____	**Ref.:**_____	**Ref.:**_____

Please use Block capitals

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Position: _____

Company: _____

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Address: _____

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For each person engaged the equivalent of one weeks salary payable by the employer within fourteen days of the date of engagement.

Signature_____ Date_____

I.S.I.S. APPOINTMENTS REGISTER (Continued from overleaf)

Ref. A.146. Indian. Male. Age 25. Single. B.E. (Civil). 1½ years Junior Engineer designing and detailing of irrigation structures and residential quarters. 3 months Assistant Engineer design and detail of R.C. multi-storeyed residential buildings and offices. Seeks post London as civil or structural engineering assistant or Designer/Draughtsman. Salary £620 p.a.

Ref. A.141. British. Male. Age 31. Married. Civil and Struc. Engg. Diploma. 1 year student engineer Civil Engineering Contractors. 2 years Articled Pupil Engineer and Surveyor. 6 months Site Engineer Civil Engineering contractors. 5 years Section Engineer and Site Agent Civil Engineering and Building Contractors. 4 years Civil Engineer with Consulting Engineer. Seeks post London or Surrey as Civil Engineer or "on the fringe of Civil Engineering." Salary £1,500-£1,600 with definite prospects.

Ref. A.142. British. Male. Age 35. Married. A.R.C.S., B.Sc., Ph.D., D.I.C. Experience: 2 years in charge of research section, main laboratories jam, jelly, canned fruit and vegetable. 2 years University research related to food preparation, etc. 4 years Senior Biochemist with fertiliser manufacturer. Seeks appointment S. England, Australia or Commonwealth in general. Salary £2,000 min.

Ref. A.175. B.Sc. Chem. British. Male. Age 33. Married. 1 year Works Chemist plastic raw material manufacturers. 3 years Ch. Technologist, rubber and plastics manufacturers and moulder. 3 years Technical Manager Plastics and Chemical manufacturers. 3 years Marketing Department oil company. Seeks Technical Management or Development post plastics/allied field/market research. London preferred.

Ref. A.143. British. Male. Age 65. Married. B.Sc. E.E. Hons. (U.S.A.), D.I.C. (London). 2½ years Electrical Inspector/Testing Engineer largest Electrical Supply Company U.S.A. 5 years Research and Electrifications, etc., railways and manufacturers U.S.A. 20 years teaching Electrical Engineering and Administration, Technical Colleges India, Pakistan and Ceylon. 2 years Technical Secretary and Editor of Journal of engineering institution, India. 5 years Consultant in India. Author of Laboratory book in Electrical Engineering. Seeks post London, Provinces, Ireland, abroad, part or full-time considered, Electrical Research or testing—heavy side. Organising/training schemes of apprentices in electrical manufacturing companies or assisting that department. Reviewing, proof reading. Technical Correspondent. Salary £1,000-£1,500 p.a.

Ref. A.144. British. Male. Married. Age 45. A.M.I.Prod.E. 7 years apprenticeship, later technician manufacturing photographic optics Germany. 4 years work study then in charge of inspection and progress U.K. manufacturer of photographic cameras. 14 years Technical Manager, then Technical director manufacturer photographic instruments. 2 years Technical Manager manufacturer precision optics. Seeks appointment Technical Management of small firm or Senior Jig and Tool designer, or Production Engineer or Product Design. London, Birmingham, Provinces or Israel. Salary £1,500 p.m.

Ref. A.145. British. Male. Married. Age 44. O.N.C. (Mech.), 3 years rigger-fitter Aircraft. 1½ years Design or Draughtsman, Engineering. 6½ years Aircraft industry Project Designer Draughtsman, Structural and Electrical Installation. 3 years Senior Project and Designer Draughtsman, Structural and Electrical Installation Aircraft and Guided Weapons. Seeks appointment London, Surrey as Senior Project and Designer Draughtsman. Salary £980 p.a.

Ref. A.147. British. Male. Married. Age 29. O.N.C. (Mech.), 4th Year H.N.C. (Mech.). 5 years apprenticeship (Toolmaker) Light Electrical Engineers. 2 years Gun Fitter (National Service). 2 years Plant Layout Draughtsman Light Electrical Engineer. At present Senior Draughtsman with Consulting Engineer. Seeks appointment London, preferably N.E. or E. as Senior Draughtsman with salary £936 p.a.

Ref. A.148. British. Male. Age 36. Married. B.Sc. (Elec. Engg.), A.M.I.E.E. 1½ years Owner/Manager transport and engineering. 6 months Sales Engineer Commercial Vehicle Sales. 1 year Asst. Workshops Manager, atomic energy. 1½ years Development Engineer, Engine manufacturing. 1½ years Senior Control Engineer electrical manufacturing. 1½ years Distribution Engineer Mining (Australia). Seeks post London or S.E. England as Executive Engineer. Salary £1,600 p.a.

Ref. A.149. British. Male. Married. Age 29. B.Sc. in metallurgy, at present employed in development of production processes, atomic energy. Interested in electro-mechanical devices and now seeking a post in Technical Sales leading to executive position which pays by results. U.K. (not London). Salary £1,250 p.a.

Ref. A.150. Indian. Male. Age 30. Single. Inter. B.Sc., Dip. Textile Technology, City & Guilds Dip. Final Spinning. 7½ years Supervisor—preparatory. Various departments Jute factory. Able to type and write technical features. Seeks appointment U.K. (London preferred) or abroad as Assistant in textile factory or office; stores, publicity, etc. Salary £750-£1,000 p.a. or would consider joining company as trainee-officer in Stores, Purchase, Sales, Publicity or Administration.

Ref. A.151. British. Male. Age 35. Married. Diploma Aeronautics, Inter. B.Sc., A.F.R.Ae.S. 2 years Technical Assistant Aerodynamic and Engine research. 14 years Experimental Engineer engine research and development. Seeks appointment U.K., France, Italy, Germany or would consider anywhere, as Engineer Executive. Salary £1,800 p.a.

Ref. A.152. British. Male. Married. Age 36. H N.C. (Mech.), H.N.C. (Elec.). Experience: 6 years test bed, switchgear manufacturers. At present employed in technical sales, responsible for co-ordinating sales, production and buying, interested metal products. Has completed 3 years part-time course in management studies. Seeks administrative or technical sales (Engineering) appointment in London. Salary £1,100 p.a. minimum.

Ref. A.153. British. Male. Age 36. Married. H.N.C. (Mech.) endorsed with "Indust. Admin." Apprentice machine tool manufacturers. 1 year Draughtsman—aircraft production. 4 years Refinery Plant operator, oil refiners. 6 years Service Engineer manufacturers of plant for food industry. At present Field Engineer, resident engineers staff (construction) with oil refiners. Seeks appropriate appointment anywhere but U.K. Salary £1,000 p.a.

Ref. A.154. British. Male. Married. Age 29. O.N.C. Elec. Engg. 6 years apprentice electrical engineers. 1 year Shipping (M.N.) 3rd Electrical Engineer and 4½ years 2nd and 1st Electrical Engineer. Seeks post U.K. (not London) as Senior Electrical Draughtsman or Engineer. Salary £1,100 p.a. minimum.

Ref. A.155. British. Male. Married. Age 71. Ph.D. Experience: 4 years Chemist, Germany. 4 years Chemist and Works Manager, Germany. 5 years Chemist and Controller, Germany. 24 years Managing Director and Chief Chemist of U.K. Company of Wax Blenders. Would like to find Library or Administrative post, part time considered. Salary is not of primary consideration. Fluent German. Working knowledge of French.

Ref. A.156. British. Male. Age 38. M.Inst.B.E., Certs. of National Building Course. 6 years draughtsman Local Authority. 3½ years senior building and civil engineering draughtsman, Chemical Manufacturers. 2½ years senior architectural draughtsman, Electricity undertaking. 6 months Chief Methods Engineer builders. 6 months Structural Draughtsman. reinforcement suppliers. 2 years Asst. Clerk of Works manufacturers of internal combustion engines. Seeks appointment U.K. in any building supervisory post or maintenance manager to an engineering concern. Salary £1,500 p.a.

Ref. A.157. British. Male. Single. Age 24. O.N.C. and H.N.C. Electrical Engineering. 5 years apprenticeship as electrician, electrical engineers. 4 years electrician, electrical engineers. Seeks post in London connected with Electrical Engineering. Salary £750 p.a.

Ref. A.158. British. Male. Married. Age 26 H.N.C. Mech. Eng., City & Guilds Cert. Motor Vehicle. 6 years apprenticeship fitter with automobile engineers. 2 years R.A.F. fitter. At present draughtsman with aero-engine manufacturers. Seeks post U.K. preferably N. England and as Development Engineer or similar. Salary £900-£1,000 p.a.

Ref. A.159. British. Male. Married. Age 27. B.Sc. (Eng.) Elec. Power, Grad.I.E.E. 6 years graduate apprentice semi-conductor manufacturer railway signalling and air brakes. 1½ years design and development of magnetic amplifiers, guided missiles. At present Technical Sales and Design Engineer equipment for printing trades. Seeks post London, Essex, Home Counties, maintenance, production or technical sales.

Ref. A.160. British. Male. Married. Age 33. A.M.I. Eng. Designers. Experience: 16 years draughtsman/estimator/representative, Pipework Engineers. 9 months representative Pipework Engineers. 1½ years representative Industrial Refrigeration and pipework fabricators. Experience covers pressure vessels, heat exchangers, tanks and general welded fabrication to the usual codes of practice, i.e. A.P.I., A.S.M.E., Lloyds, A.O.C.T. T.E.M.A., etc. Also experience of obtaining materials and general purchasing. Seeks post as Representative or Estimator, London or Southern Counties. Well known in oil and chemical industries.

Ref. A.161. Italian. Single. Age 23. Male. Qualified Italy in drawing and architecture. Employed as engineer for 3 years with Italian engineering company specialising in building of bridges and roads. Seeks appointment in London as draughtsman. Salary £600 p.a. approximately.

Ref. A.162. British. Male. Single. Age 39. H.N.C. standard in Chemical and allied subjects. Experience: 2½ years Senior Shift Engineer chemical engineers. 6½ years Experimental officer Min. of Fuel & Power. 6 months Shift Engineer i/c of production furnace, special refractory and insulating brick manufacturer. 1 year contract operator i/c of plant, oil refiners abroad. 4 years Works Chemist, cannon shells and cases. 2 years Works Chemist, detergents and toilet preparations manufacturer. Engineer, Technical Supervisor, Development Chemist or Engineer Control Chemists, etc. Salary £1,000 approximately p.a.

Ref. A.163. British. Male. Age 36. Married. O.N.C. and H.N.C. (Aero), A.F.R.Ae.S., G.I.Mech.E. 5 years aircraft apprentice. 1 year Planning Engineer aircraft designers and constructors. 2 years Air Engineer Officer, R.N. 5 years Chief Flt/Eng. Officer. British airline. 6 months Test Observer, aero-engine designers. 5 years Senior Technical Representative aircraft designers-constructors. At present i/c Planning Section aircraft designers-constructors. Seeks Managerial/Executive/Senior Technical appointment U.K. (London or S. England preferred). Minimum salary £1,250 p.a.

Ref. A.93. British. Male. Age 32. Married. High School. Cert. Chem. & Physics. Has reached B.Sc. standard in Chemical Experience. 2 years Radar Mechanic. 2 years Laboratory Assistant with lino and rubber manufacturers. 4½ years Asst. Plant Manager agricultural Chemists. 2½ years Asst. Works Manager Chemical Manufacturers. 2 years Plant Manager Chemical Manufacturer. Seeks post London or Provinces Production/Works Manager. Salary £1,500 p.a.

Ref. A.164. British. Male. Age 24. Married. Near completion of course in Engineering Draughtsmanship and Design. Experience: 8 years Wood Machinist, furniture manufacturer. Now seeks permanent appointment as Junior Draughtsman, London. Salary £12 p.w.

Ref. A.165. British. Male. Age 41. Married. B.Sc. Chem., F.R.I.C. by exam. in Organic Chem. 10 years progressive posts rising to Res. Chem. Oil Co. 4 years Chief Chemist Oil Company. 1 year Technical Adviser, Chemicals with Petroleum Company. 1 year Deputy Chief Chemist S. Africa Govt. project. 1 year Technical Manager oil re-refining and manufacturing project, S. Rhodesia. 6 months Senior Technical Officer, standards bureau. 3 years Project Chemist Patent and Licensing Division oil products and petroleum products, petrochemicals, also paints and allied products and sales technical service works, especially in chemical products. Good knowledge of Spanish and French. Seeks senior technical overseas appointment, e.g. Lab. management, management of an overseas corporation, sales technical advisor. Latin America, E. or S. Africa, Europe or U.S.A. with British company. At present resident U.S.A.

Ref. A.112. British. Male. Age 31. Single. G.C.E. "A" level Chem., pure and applied maths. Also passed maths. at B.Sc. Gen. Exam. 1 year technical clerk, brewers. 5 years analyst in metallurgical work. 2 years radio and electronics. 7 months analyst pharmaceutical chemists. Seeks post with one day per week release to complete B.Sc. June 1960. Chem. Lab. work or electronics, London. Salary £700 p.a.

Ref. A.113. British. Male. Married. Age 41. A.F.R.Ae.S. 2 years Technical Representative aircraft manufacturers. 8½ years Senior Draughtsman, aircraft manufacturers. 4½ years Liaison Engineer. 3½ years Project Engineer aircraft manufacturers. 1 year Senior Designer, astronautics. Seeks post Engineer or Technical Representative London, Surrey or America. Salary £1,200 p.a. minimum.

Ref. A.166. British. Male. Age 32. Married. Apprenticeship in General Engineering. 1½ years Maintenance Engineer engine manufacturers. 8 years Installation Engineer Bakery, Chemical and General Gnrs. Seeks post anywhere as Installation Engineer Salary £1,200 p.a. Has experience site management and control of labour.

Ref. A.167. British. Male. Married. Age 36. Experience: 12 years Works Manager engineering. At present employed as Production manager, light mechanical engineering and toolmakers. Seeking post as Works Manager, engineering. Anywhere in U.K. Salary £1,500 approximately.

Ref. A.168. British. Male. Married. Age 25. O.N.C. and H.N.C. and Endorsements (I.E.E.). Has completed 2 years training course for Higher Management. At present foreman-electrician, coal mining. Now seeking appointment U.K. or abroad as Electrical Engineer. Salary £950 p.a.

Ref. A.169. British. Male. Married. Age 37. M.I.Mar.E., M.I.Plant.E. 7 years apprentice, maintenance engineer glass makers. 5 years marine engineer shipowners. 1½ years. Engineer-Surveyor, insurance company. 1 year lubricants representative, oil refiners. 2 years Chief Engineer shipowners. 5 months foreman of development workshops, glass-makers. At present Asst. Works Engineer electric cable makers. Seeks post London or Provinces as Chief Works Engineer, Plant Engineer or similar. Salary £1,600 p.a. minimum.

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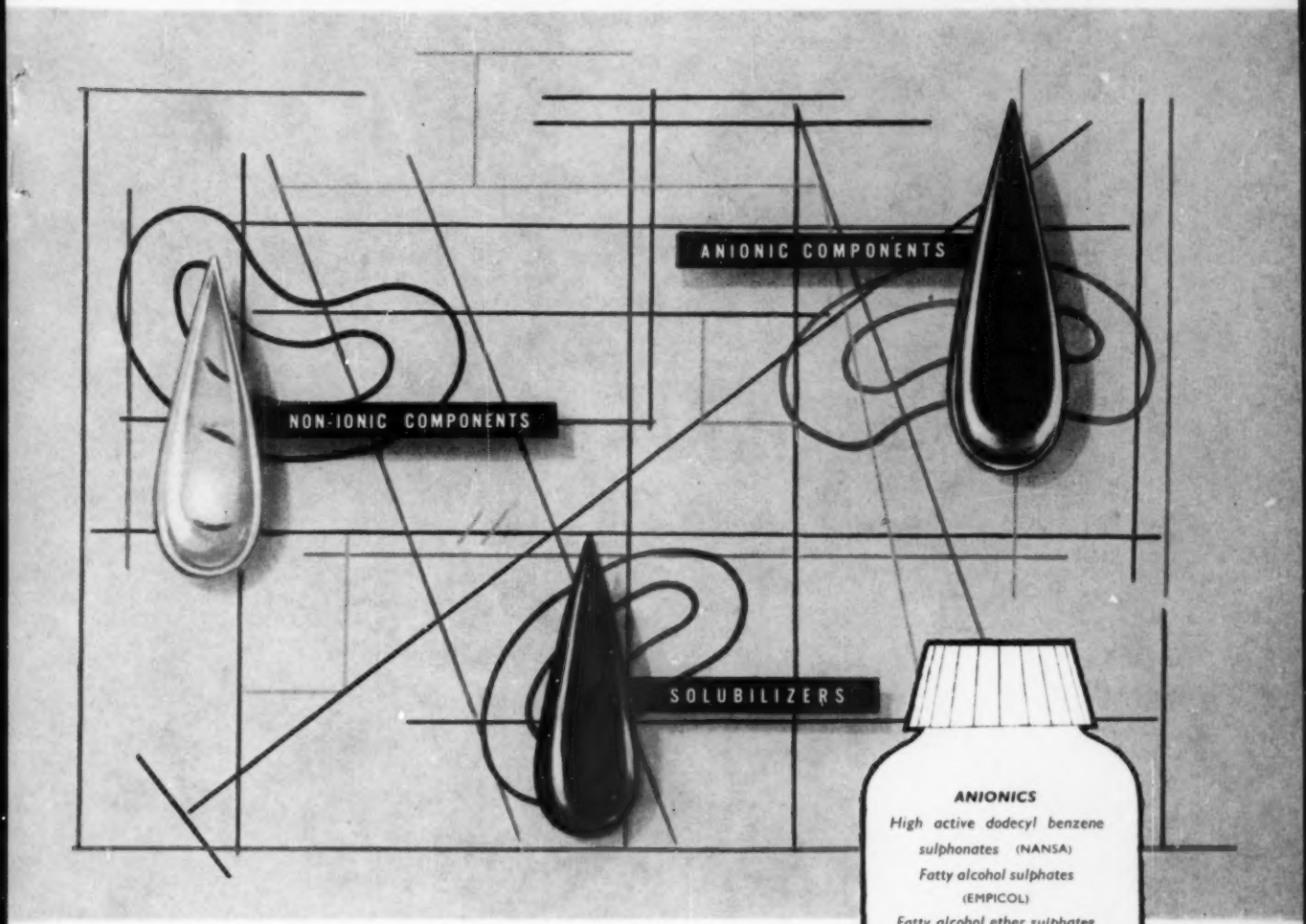

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